

THE IRON AGE

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BETHLEHEM STEEL COMPANY

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Revival in Durable Goods Industry Impends, Politics Permitting

By G. L. LACHER
Managing Editor, The Iron Age

• • •

NO bard has sung the song of industry. No philosopher has plumbed its meaning. No historian has caught its real significance. The industrial revolution created a new civilization without creating a new culture or a new ideology. The articulate, in school, pulpit, bar and press, still speak the language of the handicraft era. Ancient concepts, born of another age, persist despite sweeping changes in our ways of working and living. Law, religion and medicine are still kotowed to as the only professional callings that really count. European contempt for trade and all that is connected with it continues to find echoes in this country, despite our greater freedom

from traditional bias. Old world acceptance of inherent class antagonism—between patrician and plebeian, nobility and peasantry, bourgeoisie and proletariat—still insinuates itself into our normally peaceful and essentially democratic social relationships.

Hero worship is still confined to warriors, statesmen and political chiefs. History is still focused on Caesars, Napoleons, kaisers and kings. Our "great world," as in Europe, consists of public men, whom we condemn or applaud as our fortunes rise or fall.

THE real world in which we live, the world of modern industry, remains unseen except as misunderstanding outsiders misrepresent it. Those with the gift of tongues, the learned and the glib, consciously or subconsciously minimize, deprecate and criticize the arts of trade and industry the better to magnify their own importance by contrast.

The doers, the creators, the men who make the wheels of industry go round, remain in the background, un-

heard and unsung. They, though unheeded, have learned through hard experience, the wide difference between theory and practice. They know that technical progress demands infinite patience in ironing out the kinks between paper plans and workable realities. They are, furthermore, aware that social progress is always a compromise between technical perfection and human nature.

Not that men of industry are lacking in ideals or principles. On the contrary, their standards on the average are as high as, or higher than, those in any other walk of life. But necessity has schooled them to deal with life and with human nature as they are, to distrust inexperience and panaceas, and to center their attention on what is practicable.

What they have wrought during five years of depression, and particularly in 1934, is an amazing demonstration of untiring initiative and indefatigable perseverance in the face of most discouraging conditions. Like the busy bees, they toil without let, creating new products and devel-

opening new outlets for old products. The ingenuity, the skill, the art and the scientific attainment that have been, and are being, employed to perfect processes and goods are a tribute to the inexhaustible fecundity of competitive enterprise.

MEN of industry take no stock in the warnings of alarmists that our days of expansion are over and that the present need is a redistribution of wealth. The idea of a fixed fund of wealth to be fought over by opposing classes as dogs fight for a bone is an old-world conception that doesn't register among industrialists. Wealth in modern machinery is elusive. A plant costing millions may be worthless if improperly equipped or poorly managed. Idle productive equipment is a liability rather than an asset.

What is important today is not a redistribution of wealth but the widest possible distribution of the fruits of production. In the absence of progress in the art of production, our so-called wealth could be consumed within a relatively few years. In other words, if there were no profits and nothing were set aside for rehabilitating plant and equipment, it would not be long before productivity would decline and the volume of con-

sumer goods available for distribution would dwindle. Wealth is chiefly valuable because it can be utilized by enterprise to perfect and lessen the cost of productive processes. Wealth in incalculable amounts has vanished beyond recovery in the depression years because it has remained idle and has not done the work for which it is suited.

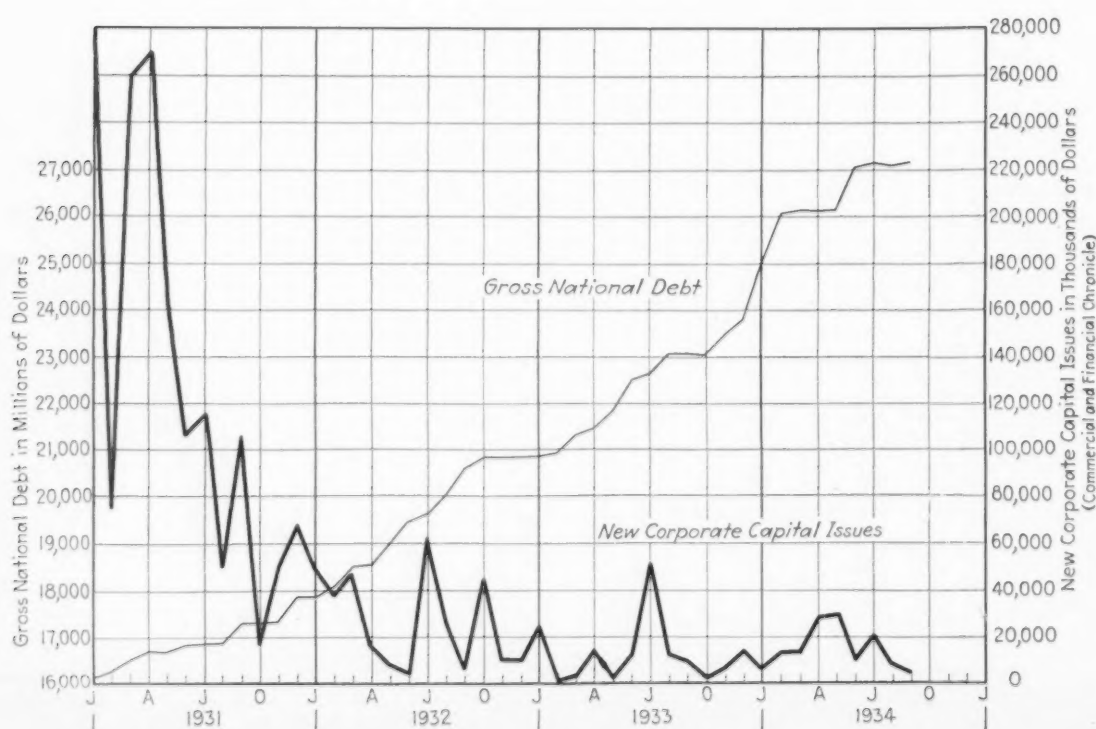
And why has it remained idle? Because of fright. The deflation precipitated by the stock market crash caused a steady withdrawal of capital from enterprise. All who had savings felt the urge to convert equities into money. Finally, when the banks became unsafe as repositories of money, hoarding set in and banking operations were paralyzed. Faith in the security of our banking structure was at length restored and funds for short-term loans are now available in abundance. But the confidence necessary to revive the flow of capital into long-term financing is still lacking. Mounting Government expenditures, with their forebodings of steadily swelling taxes, and chronic labor trouble, born of Section 7a of the National Industrial Recovery Act, have caused those with savings to despair of the possibility of obtaining returns on investments. Moreover, the soaring Government debt has raised

doubts as to the future value of our money, thereby further discouraging fixed return financing.

CAPITAL demands and must be given assurances. The reenlistment of capital is the crux of the unemployment problem and the key to recovery. Col. Leonard P. Ayres has shown that 77 per cent of our unemployment in productive enterprise is in the durable goods industry. Thus the major part of unemployment in industry is directly due to the idleness of capital. Service occupations—transportation, retail trade, the professions, etc.—account for nearly one-half of our total unemployed, but as Colonel Ayres states, "the major part of the idleness among the providers of services is caused by the lack of work for the producers of goods."

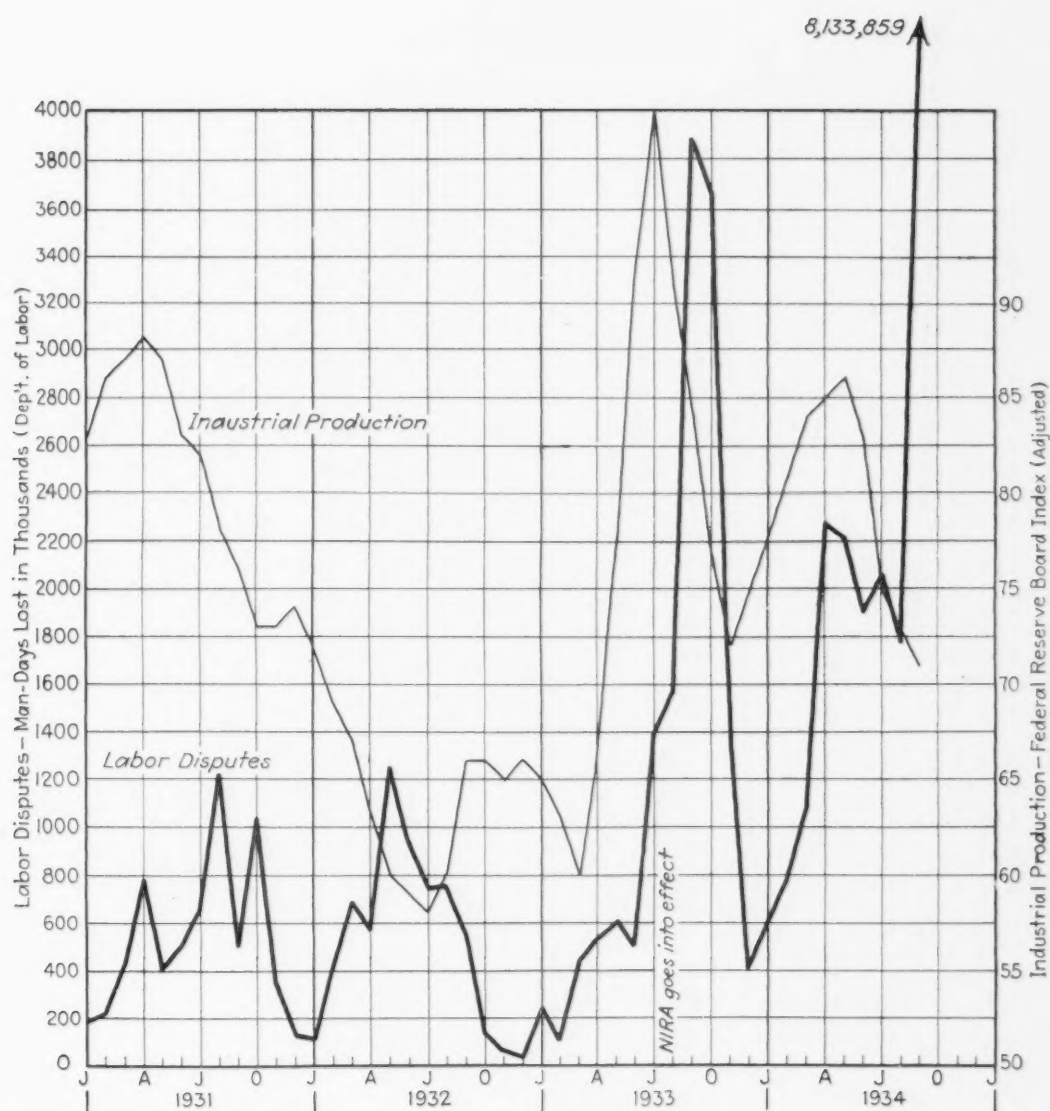
It is true that we have had two sharp and short-lived upturns in industrial production in the past two years, but both of them were caused by fear rather than confidence. In the 1933 rise, fear of inflation and anticipation of higher costs under the NRA were motivating influences. In the case of the 1934 increase, speculative buying in advance of price increases was the principal cause.

The erratic course of production in this country contrasts sharply with



THE key to business recovery is a revival of capital investment. New corporate capital issues in this country have remained at a low level while our national indebtedness has mounted.

INDUSTRIAL production, under NRA, has been hampered by an epidemic of strikes.



the comparatively steady upward trend in such countries as Great Britain and Germany. As is shown graphically elsewhere in this issue, the depression low for steel production was 15 per cent of the 1929 high in the United States, 27 per cent in Germany, and 38 per cent in the United Kingdom. Without major fluctuations German output has risen to 67 per cent of its 1929 high, and British production to 85 per cent, while the United States is up to only 37 per cent.

IN view of the greater abundance of capital in this country, this is a disappointing showing. And it cannot be charged to the avarice of capital. Far from being greedy, capital today is satisfied without any return so long as it can secure safety. And even in

more normal times it has charged little for its services, a fact that commonly is overlooked because of the conspicuous profits of a few outstanding successful enterprises. In the 10 years 1919 to 1929 the net profits upon aggregate gross business of all manufacturing corporations, as reported to the Treasury, were at the rate of 4.23 per cent a year, according to the December bulletin of the National City Bank of New York. For the period 1919 to 1932, which included our worst depression year, profits averaged 3.62 per cent.

CAPITAL will work for a small wage, but like labor it wants security. And granted reasonable security, it will bring revival to the durable goods industry. Durable goods, and more especially capital

goods, are little understood outside of business. The interdependence of agriculture and industry is commonly appreciated, but the two-fold character of industry is too often overlooked. Our economy really rests on a three-legged stool, one leg being agriculture, one leg industrial production and the third equipment. To maintain and increase the efficiency of both agricultural and industrial production constant improvement and rehabilitation of our tools and plant are necessary. The funds for that purpose are loaned or invested out of the savings of our people. The savings, in turn, are made possible by the increasing efficiency of our productive equipment.

While our fund of savings has remained idle, obsolescence and depreciation have gone on without

interruption. A huge accumulation of needs in capital goods has piled up, as is graphically shown elsewhere in this issue. With further evidence of conservatism in Government policy, those needs will be translated into purchases. Even now there are rapidly multiplying indications of an impending revival of demand.

TO give further impetus to this favorable trend it is only necessary that Government policy be completely purged of unsound theory. The size of the Federal debt is less important than the intentions of the Administration regarding further expenditures. The debt charges of the United Kingdom consume $12\frac{1}{2}$ per cent of the national income, whereas our Federal indebtedness takes only 2.16 per cent of our national income, but British budgetary policy is such as to inspire confidence. So long as a government moves in the direction of debt liquidation it will experience no difficulty in marketing its certificates of indebtedness on increasingly favorable terms. But if a government piles expenditure on expenditure without apparent heed of future consequences public faith will be destroyed.

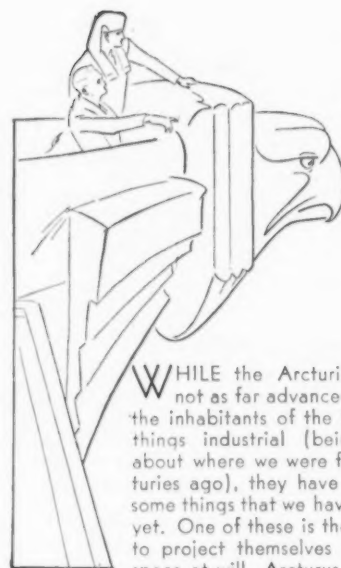
The confidence essential to a revival of private enterprise also depends on the possibility of profitable operations. Investors do not demand, and never have demanded, a sure return, but they do ask for reasonable assurance that they are not taking risks in vain. If chronic labor disturbances or increasingly onerous taxation imperil the chances for profit, initiative and investment will languish. Profit, whether called by that name or given some other designation, is essential in all economic societies — capitalistic, communistic or what have you—to provide the savings needed to maintain and improve the means of production. Without continuing in-

vestment in the means of production, i.e. capital goods, economic decay is inevitable.

The profit motive, so commonly maligned, is the only source of improvement in the economic status of a nation, whether it be Soviet Russia or the United States of America. In Russia a much larger share of the national income has been put into capital goods in recent years than in this country. It matters little that this sacrifice of consumption goods for the sake of producer goods has been made under the auspices of a State-owned industrial system. The effect on the individual is the same. He has been forced to forego present needs, comforts and pleasures for something better promised for the future. A different form of organization does not alter the common problem of all economic societies.

NO spirit of reform, whether called the "New Deal" or otherwise labeled, will accomplish lasting good if it fails to recognize the need for profits. The substitution of Government for private control in any business does not alter that fact. The final results, in terms of the well being of the people, will depend on the relative efficiency of the two forms of management. But in the meantime the extension of Government competition into fields heretofore occupied exclusively by private enterprise has a disturbing effect on private investment in general. If the Government can go into the power business, duplicating present facilities, what will prevent it from entering other fields now occupied by private business? New capital outlays will continue to be timid so long as such a threat exists.

If the Government wants a revival of private initiative, it must re-



WHILE the Arcturians are not as far advanced as are the inhabitants of the Earth in things industrial (being now about where we were five centuries ago), they have learned some things that we have not as yet. One of these is the ability to project themselves through space at will. Arcturus imparts this secret to his Earth guide and hence, in an instant's time, they are looking down upon the moving arms of a giant ore unloader. In the stellar home of Arcturus, ore handling is still a matter of sack and back and iron and steel in consequence are semi-precious metals. Naturally, he is amazed not merely by the ingenious ore handling mechanisms but even more by the vast quantities of material which such mechanisms imply.

move the fear of progressive nationalization of business. Capital must be given this assurance before it will again flow freely into the capital goods industry. Meanwhile it is a waste of breath for Administration spokesmen to chide business men for lack of courage. It is the anonymous millions who possess the savings of the country who lack courage. And they are not likely to show greater venturesomeness in risking their savings unless Administration policy swings further toward the right. Indications are, therefore, that the capital goods industry will revive, politics permitting.



Steel Producers Win

New Markets For 1935

*New Rolled Products Are Developed and Many
New Applications for Steel Are Uncovered*

By F. L. PRENTISS

Cleveland Resident Editor, The Iron Age

DURING 1934 the steel industry looked forward to the future with confidence, and paved the way for broader consumption of steel by developing new products designed to be more suitable for specific applications than steels heretofore produced.

While newly introduced ferrous materials were not numerous they were conspicuous and showed a trend toward the production of steel with improved physical properties for special purposes and particularly toward the making of high-tensile steels for use in the railroad field.

Considerable attention was given to the development of abrasion resistant steel and special steels for corrosion and heat resistance for pressure tank work in the oil industry. Consumers have awakened to the advantages of special steels for special purposes and probably are watching the bringing out of new steel products more closely than ever before.

Quite aside from the new products introduced by the mills, there was a marked extension in the uses of steel

in 1934. Undaunted by the depression, the constructive ingenuity of manufacturers and engineers bore fruit in the bringing out of many new products in which steel was sub-

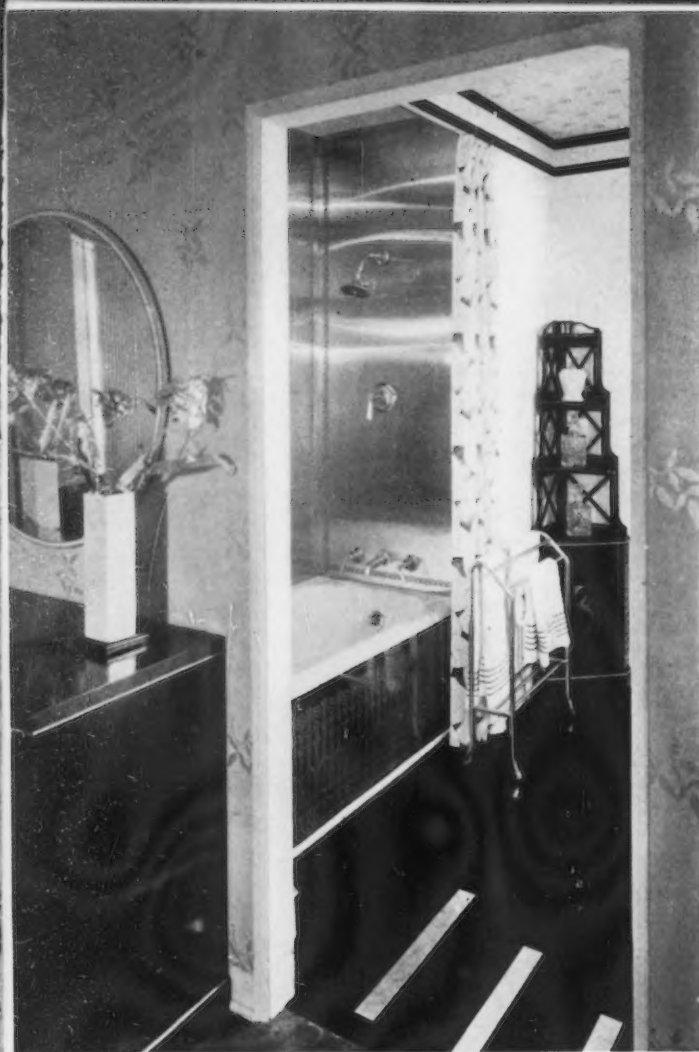
UNDAUNTED by the depression, the steel industry has carried on a consistent campaign to widen its markets. Searching the highways and byways, it has uncovered and developed an increasing diversity of new applications for steel. At the same time it has developed new products, many of them alloys, to better serve the needs of its customers.

Without resort to grandiose generalizations and without dependence on so-called economic "planning," the steel industry has worked quietly and unobtrusively creating new specific demands and supplying new specific needs, thereby laying the best foundations for business revival.

stituted for wood and other materials. Steel manufacturers themselves took an active part in the development of mill products in new forms and for new uses in order to expand their market. Steel makers have in many cases improved the quality of their products with little if any change in the chemical and physical properties.

In the list of new products made of steel and other metals consumer goods led. Perhaps this was largely because the articles used in the home found a more ready market than products that might be listed in the heavier capital goods industries. There was also a trend among manufacturers of consumer goods to improve their products in design and appearance, and steel manufacturers have aided in these efforts by supplying a greater variety of materials.

One of the most active fields for the expansion of steel consumption during 1934 was the kitchen equipment industry. Another field in which there was marked progress was the modernization of stores through the replacement of old fronts with



ART and metal
combine to
produce this pleas-
ing effect in the
Stran Steel-Irwin
town house, shown
at A Century of
Progress, Chicago.

artistic creations of metal construction. Both these fields have extended the market for porcelain enamel and stainless steel. The trend in gasoline station construction also was toward increased use of both enamel and stainless steel. There was likewise a marked trend toward greater use of stainless steel in food industries.

In the commercial and residence building field new formed steel products were brought out and new meth-

ods of applying steel were developed that will tend to increase the use of steel in construction work. New applications for steel were found in various construction projects carried out by the Federal Government, and new products for both construction and road building work were introduced by mills during the year.

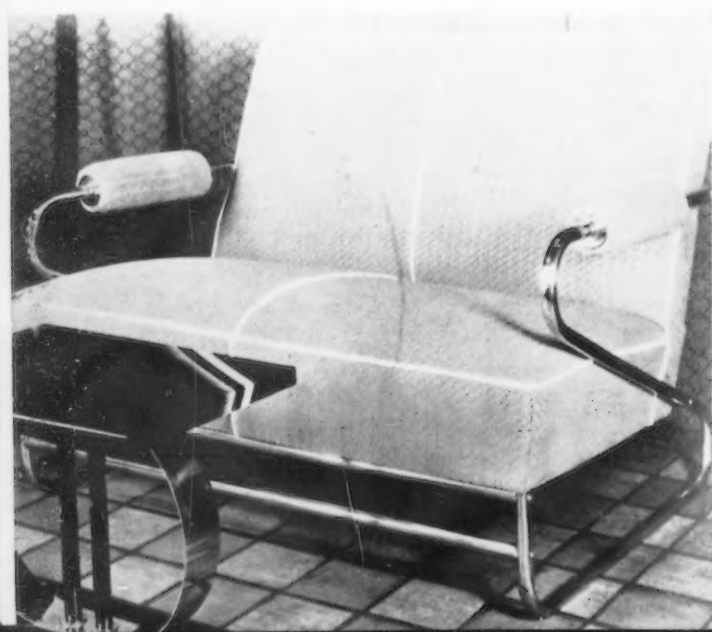
The year 1934 was particularly notable for the widening application of steel among the smaller consuming

industries, a fact which has not only resulted in a growing diversification of demand but has created a large actual and still larger potential tonnage outlet for the mills during a period when the flow of steel to the major consuming industries has been sharply reduced. It is not generally appreciated that the percentage of steel used by miscellaneous industries has grown in recent years at the expense of the more conspicuous consuming groups. In 1933, 25½ per cent of the steel produced went into unclassified industries as compared with an average of 17.6 per cent in the years 1925 to 1927 and 19.3 per cent from 1928 to 1930 inclusive.

New Rolled Steel Products

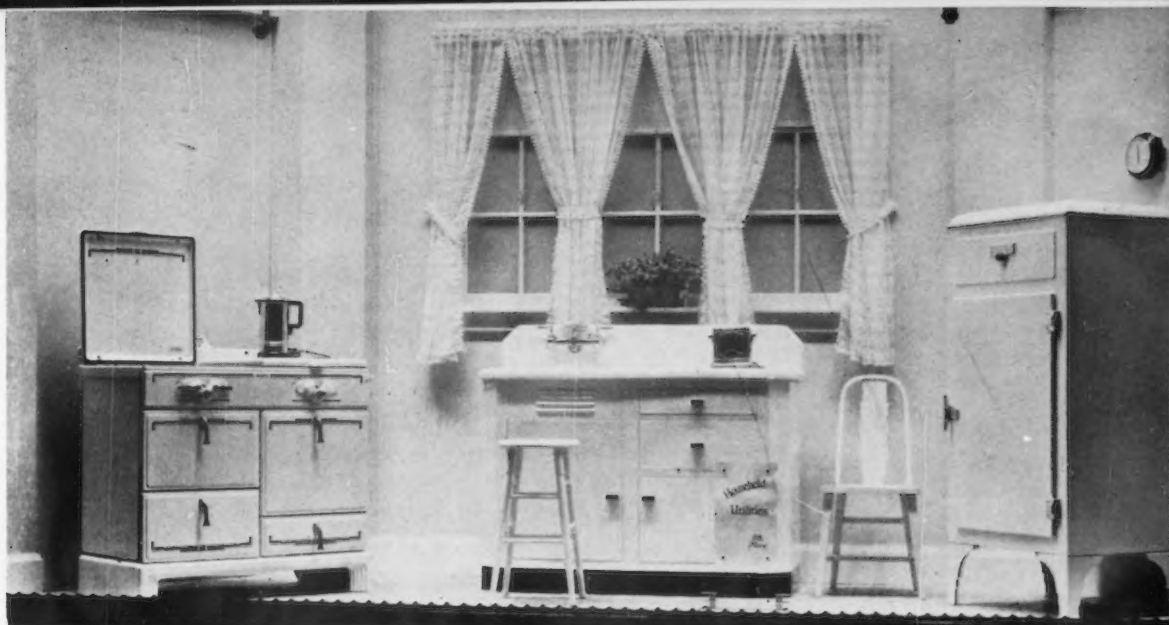
In new rolled steel products one of the most important developments of the year was the bringing out of new grades of low-alloy high-tensile steels for use where lightness is desirable without decrease in strength and where increased corrosion resistance is advantageous. These steels are stressed as being of particular advantage for both freight and passenger car construction. Their use in building freight cars permits the substitution of lighter structural members, materially reducing the dead weight. In warship construction they offer the advantage of a reduction in the weight of speedy cruisers without sacrificing strength.

Three grades of special high-tensile steels recently were put on the market by the United States Steel Corp'n. for use particularly in the railroad equipment field. These are produced in shapes, plates, bars, sheets, strip, wire and tubular products. One grade, Cor-ten, is a low-chromium, copper silicon alloy steel low in carbon and with a high phosphorus content. This steel is claimed to have four to six times more resistance to atmospheric corrosion than regular carbon grades of steel. Another grade, Man-Ten, is a medium-manganese steel applicable to parts subjected to high working stresses and where great atmospheric corrosion resistance is not required. The third grade, Sil-Ten, is a structural silicon steel for use where the corrosion-resistant qualities of Cor-Ten and the physical properties of Man-Ten are not required. These steels, it is stated, can be welded by the usual methods. Through the rede-



NEW modes in
steel furniture.

• • •
STORE display of
 steel kitchen
 equipment.
 • • •



signing of freight cars these high-strength steels in the form of welded and pressed parts, it is pointed out, may be substituted for castings.

Some of the uses of these steels outside of the railroad field are touched upon later in this article.

A piling section identified as SW-23 has been produced for the past year by the Jones & Laughlin Steel Corp. This piling is straight webbed and is made in 23-lb. sections. It was used in the core wall of the earthen dam at Fort Peck, Mont. The piling for that project was supplied in single lengths of 66½ to 85 ft. Two single lengths were spliced by welding to make up the required total length of 146½ ft. About 7500 tons of the piling was used for the Fort Peck dam.

A new galvanized wire to which the zinc coating is applied by the electrolytic instead of the hot-dip process has been brought out by the Bethlehem Steel Co. and is designated as Bethanized wire. The proc-

ess permits, it is stated, a coating two or three times as heavy as can be applied by the older process. Advantages claimed for this wire include ductility, ability to withstand bending and forming operations without failure, and improved appearance. It is made for telephone and telegraph service, for fence wire and in any grade of steel for products for which galvanized wire is used.

Among other new Bethlehem products are hot-forged nuts developed for heavy-duty applications, particularly on the railroads for rail joint fastenings. These are made of high-carbon open-hearth steel. Forging gives them a toughness and dense structure.

Chrome-nickel stainless steel of the molybdenum type commonly called 18-8-Smo and containing approximately 18 per cent chromium, 10 per cent nickel, 3 per cent molybdenum and 0.06 per cent carbon, which is manufactured by the Republic Steel Corp., recently has been adopted

rather generally by the sulphite branch of the paper industry. In the paper and pulp industry where sulphuric acid is encountered the use of 18-8 stainless steel without molybdenum has not proved satisfactory. The addition of molybdenum, however, results in an alloy which is entirely resistant to the action of sodium sulphite pulp liquors.

The new steel is being used in the manufacture of digesters, lining for circulating systems and other equipment. This steel can be welded and it is stated that with the low carbon content and molybdenum addition there is no danger of weld decay. The steel is being made in the form of sheets, strip, tubing and castings and in other forms. Several manufacturers have standardized on this steel for castings used in sulphite equipment.

This stainless steel of the molybdenum type also has met with favor in the textile industry. In the dyeing branch of this industry some of

• • •
BARN at Long-
 water Farms,
 North Easton, Mass.,
 famous Guernsey
 establishment. Loud-
 en steel stalls and
 stanchions, water
 bowls, manger divi-
 sions and cow pens,
 with tilting mangers
 for feeding.
 • • •



the dyes, particularly those used for woolen goods, are of a strong acid nature and the addition of the molybdenum is said to have resulted in a steel that is superior to the regular 18-8 steel.

Another alloy steel recently developed for resistance to corrosion in both sulphite and sulphate pulp and paper mill application is a two-ply rustless steel having 20 per cent layers of 23 per cent chromium and 11 per cent nickel bonded to mild carbon steel. This alloy, which is manufactured by the Ingersoll Steel & Disk Co., Chicago, is designated as Ing-O-Clad 23-11.

Another Republic alloy steel the use of which materially increased the past year is a low-carbon 18-8 steel with approximately 0.35 per cent titanium. The titanium analysis has been used almost entirely for high temperature applications, as demonstrated by the exhaust manifold and collar rings for aircraft work. These parts, under flying conditions, are at a red heat and are subjected to considerable vibration, as well as to the corrosive action of the exhaust gas. This analysis is a standard one with both the Army and Navy departments, as well as with some commercial manufacturers.

Sil-con and electrical steel is a recent product of the Republic Steel Corp. This is produced in the form of strip in five grades up to 14 in. wide and in various gages. Being supplied in coils its handling is economical.

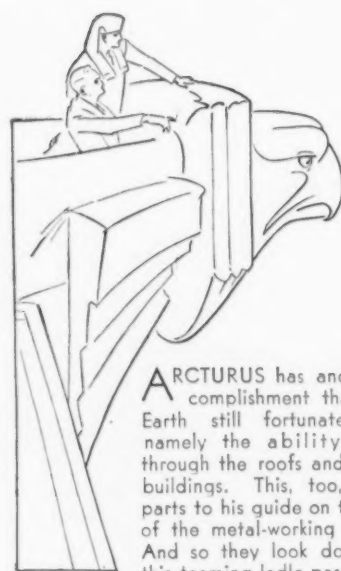
New applications for stainless steel

are constantly appearing. The United States Navy Department has been using considerable quantities of cold-rolled high-tensile stainless material for deck houses, water-tight doors and hatch covers. The War Department is using mirror-finish stainless sheets and plates for drying photographic plates. An Eastern advertising firm recently purchased a mirror-finish Enduro stainless steel belt for use in a continuous print drying process.

Mirrors of stainless steel are used in cells and rooms in several prisons and other State institutions because the stainless material will not shatter like glass and cannot be used as a weapon to injure a guard or in an attempt at self-injury. Another use is for mirrors in compacts.

One of the largest uses that has been developed for Enduro mirror-finish plates is for use in the pressing of laminated paper products. A high degree of finish is required in the pressing of these products, as any defect on the press plate is transferred and exaggerated on the product being pressed. Some of the plates have a mirror finish on each side. The use of stainless steel press plates is said to have been a very important development in the paper industry and to have resulted in a product much superior to that formerly obtainable with other press plate materials.

The textile industry recently began using dye sticks, spools and bobbins of stainless steel, which is well adapted for these purposes because of its resistance to acids. As a consequence,



ARCTURUS has another accomplishment that we of Earth still fortunately lack, namely the ability to see through the roofs and walls of buildings. This, too, he imparts to his guide on their tour of the metal-working industry. And so they look down upon this teeming ladle passing over a row of ingot molds. Arcturus is not a stranger to heat, there being plenty of it where he comes from. But this application of heat is new to him and he is amazed to learn of the precise control not only of temperature but of chemical and physical conditions that is necessary in taking this important essential step in the making of high-grade steel.

it is taking the place of wood and non-ferrous metals.

Stainless steel tableware is becoming more commonplace. With the stainless steel kitchen utensils which have been on the market several years and a complete line of tableware now available and many hollow ware articles in stainless steel, it probably will not be long before complete stainless steel equipment may be had for the kitchen and dining room.

Chromium-plated trays have become popular for table service, and other tableware is also being made of the same material. The use of stainless steel for trays for service use in restaurants and at bars is growing fast. These are replacing composition trays and those made of other materials. Electric food mixers are now being made with bowls of pressed steel chromium plated, which are taking the place of china bowls.

A very recent application of stainless steel is for display racks for fruits and vegetables in retail stores. These retain their bright finish while racks of other materials quickly become tarnished as a result of frequent sprinkling of vegetables.

Aquarium frames are now being



ARMCO-FERRO house at World's Fair—an example of modern architectural beauty.

made of stainless and chrome and nickel plated steel.

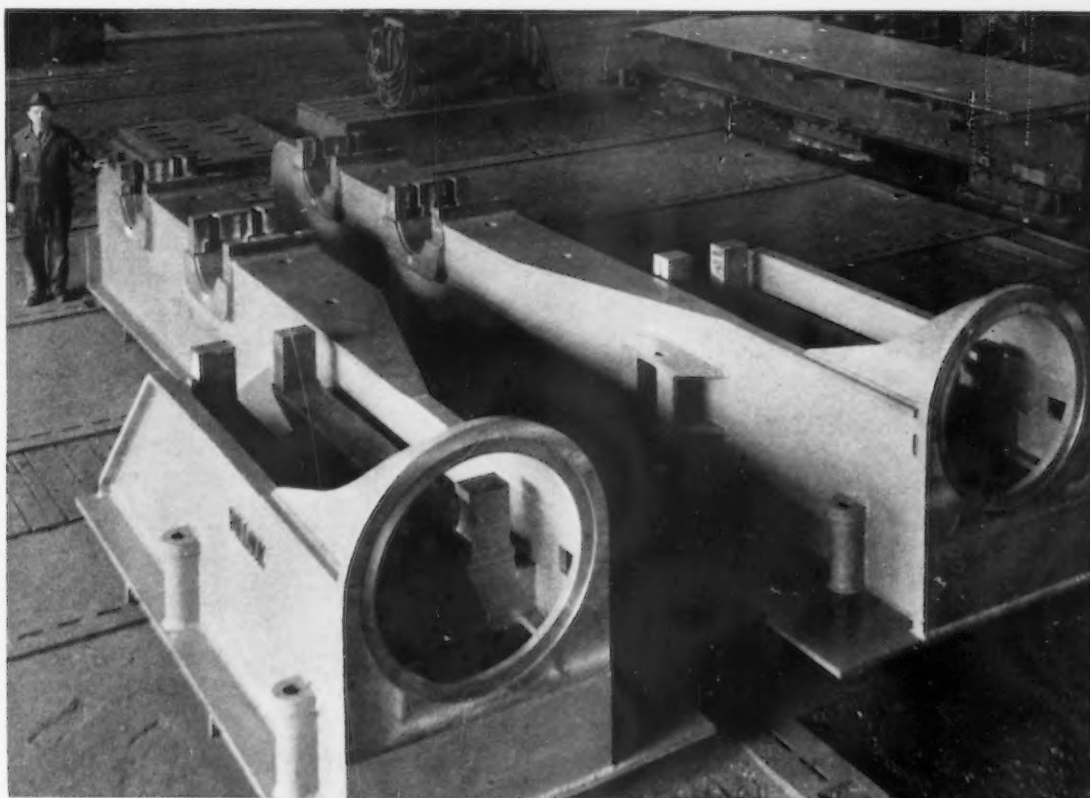
Another application of stainless steel which seems to be growing rapidly is in the jewelry field. Pocket and wrist watches, wrist bands and numerous items of jewelry are now available in stainless material.

A number of pen manufacturers are employing stainless steel which

Metal Mfg. Co., Canton, Ohio, already have created an outlet for a considerable tonnage of steel. These shells are formed from steel plate of No. 11 to No. 3 gage and heavier into tapered tubes, and the longitudinal seam is then arc welded, after which the tubes are cold rolled, fluted and the rough ends are cut off. A pointed steel nose is arc welded to

tions assure strength. The piling is made in an interlock type for permanent installations and in a clip type with welded interlocking clips, which may be used several times. Piling may be driven by hand or power. Some recent applications are in connection with Government work in the Central West, including Mississippi River locks.

ARC - WELDED
steel frame for
a reversing bloom-
ing mill engine.



contains molybdenum for making pen points.

Porch and Lawn Furniture As an Outlet for Steel

New applications of steel as a substitute for other materials are constantly developing. While some of these uses are for products that are not likely ever to take a large quantity of steel, others give promise of eventually requiring sizable lots. The manufacture of porch and lawn furniture from steel both in tubular and other forms is a rather recent development. Another fertile field is the manufacture of playground equipment of steel, which is said to have been growing rapidly the past year or two.

Steel Piling

Fluted shells for tapered cast-in-place concrete foundation piling, a recent development of the Union

the point end of the pile and a steel collar is welded to the butt end.

These piling shells are driven in lengths up to 80 ft. or more, and when the length is over 40 ft. two tapered sections are arc welded to form one watertight casting. The piles are driven with a steam hammer. The piling is being used for grade elimination and bridge projects and in building work. In the recent construction of an incinerator in Cleveland, 725 of the piles of 11-gage in 60-ft. lengths were used.

Corrugated sheet steel piling is a recent product of the Youngstown Pressed Steel Co., Warren, Ohio. This is designed for use for construction work where light piling is suitable, such as for coffer dams, retaining walls, sewer trenches, levees and building excavations. The piling is made of 8 to 12-gage material and in lengths up to 30 ft. Deep corruga-

Steel bearing piles in the form of H and CB sections in various sizes have been brought out by the Carnegie Steel Co. as a substitute for wood or reinforced concrete piling. This steel piling, it is claimed, is particularly adaptable for service under various soil conditions, can be driven with a small displacement of the soil, and is more easily handled and driven than wood or reinforced concrete piling. These bearing piles are applicable where great penetration is necessary to secure adequate bearing capacity, such as under the conditions encountered at the Bonnet Carre spillway site near New Orleans, where the piling was driven to a depth of 122 ft.

Metal Cribbing

Armco metal cribbing for retaining wall construction is a comparatively new product that has won

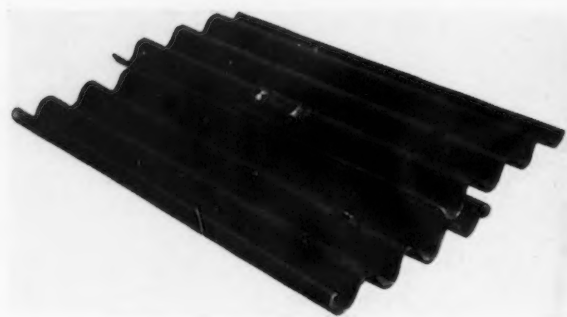
favor among engineers and contractors. This consists of two box-like metal units which, when assembled on the job, form continuous rows of interlocking bins that are filled with earth or other material.

Another recent Armco product is Multi-plate culvert material composed of thick corrugated iron plates designed for use in building or replacing large-size drainage structures.

Bridge Floors and Highway Guard Rails

A new application for steel for highway and railroad bridge roadways and for other heavy-duty floor

• • •
CORRUGATED
piling made by
the Youngstown
Pressed Steel Co.,
Warren, Ohio. Photo
shows both the plain
clip and the inter-
lock types.



Guard rails for highways as a substitute for wood and in some cases replacing cable are coming into extensive use in many States and take

Steel posts are replacing wood and concrete for supporting these highway guard rails. The posts are in various forms. Some are cut from I-beams, others from a small H-section of heavy gage strip steel that is rolled into a somewhat triangular shape and fitted with a cap at the top.

Stainless Steel for Revetment Work

Steel, principally in wire or cable form, is now playing an important part in revetment work along the banks of the Mississippi River. Formerly levees were protected by mats woven from willows cut along the river. This work required large numbers of men and there were stretches along the river where willow growth was not available. Later, pre-cast concrete blocks were strung on wire cables but corrosion of the cables has always been a serious problem.

Then engineers turned to copper-bearing steel for this purpose, and recently they have been buying cables made of stainless steel. It is stated that at least 1000 tons of stainless steel has been used in this work during the past year. It is expected that this will be a good outlet for stainless steel wire for some time to come.

Cast concrete blocks and cast asphalt, both reinforced with wire mesh, are being used on levee work along the Mississippi River. This is

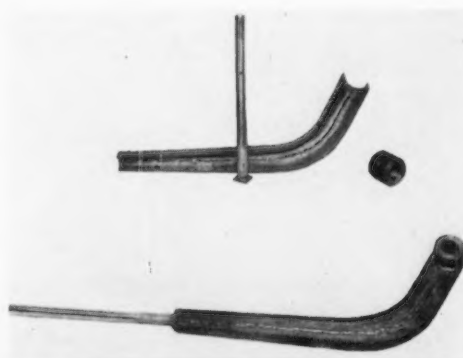


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ENDURO, 18-8,
used for Solar
anti-monoxide - ex-
haust manifold in
United States Navy
plane.

surfaces—a bridge floor slab designated as I-Beam-Lok armored slab—recently was brought out by the Carnegie Steel Co. The slab consists of a combination of I-beams and cross beams inserted in slots in the beams and formed strips all welded together. The space between steel members is filled with concrete, providing a floor slab unit that is said to be a highly efficient combination of steel and concrete. In addition to other advantages claimed, weight is saved, the reduction in the dead load being sufficient to permit a saving in the cost of the entire structure.

a sizable tonnage of steel in the form of hot-rolled strip 12 in. wide and 12 to 16 in. gage.

• • •
HANDLE for a
paper cutting
machine made of
standard parts, weld-
ed together.
(Courtesy Lincoln Elec-
tric Co., Cleveland)



a rather new development and will require, according to present estimates, about 2000 tons of mesh a year. It is stated that about 1500 tons of cable are used a year for this particular levee work.

Expansion Joints and Floors

Another new development is an open expansion joint now specified by many States for new concrete road-work. This is a metal box section made from hot-rolled strip or sheets, which are used at the rate of about 8 tons per mile of highway. Dowels are also required and some wire is used to hold the dowel in place while the concrete is being poured.

A recent application of pressed steel which is growing is for railroad crossings and floors. Special forms designated as Weltrus highway crossings and Intertracks slabs made by the Truscon Steel Co. have won recognition in the railroad field because of their permanence and low cost, and these products promise to take an increasing amount of steel. Products for somewhat the same purpose but more particularly designed for use for factory floors subjected to heavy traffic are special floor plates and blocks. The blocks and the highway crossing and slabs are concrete filled. The plate is installed directly to the wearing surface.

Steel for Protection Against Termites

Another new use of steel is for protection against ants. The Government in its fight against the termite, the white ant which eats away the timber in houses, is recommending that all pipes that come through the ground be fitted with a cone-shaped collar, the cone being turned down. These cones are made of sheet steel. The Government is also recommending that sheet metal flashing be used along the outside and inside walls of houses where the wood structure starts. This flashing would be turned down at a rather sharp angle. This would prevent termites from coming up the foundation and getting into the wood part of the structure.

Wider Use of Mechanical Steel Tubing

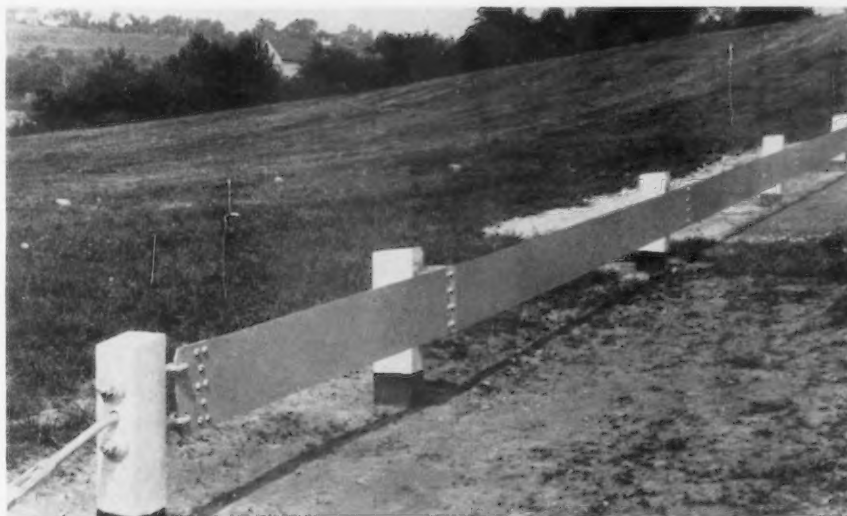
Steel tubing in electrically welded form found many new fields for use during the past year and its application appears to be almost unlimited.



FIRST battery of six all-welded Plykrome stainless clad tanks to be used for the transportation of flour in bulk, as fabricated by Alloy Fabricators, Newark, N. J.



NEW design of low-cost steel building. The panels vary only in length.



STEEL plate guard rail for highways.

Tubular steel furniture, while not a new product, enjoyed marked growth in demand. The production of electrically welded and seamless mechanical and structural steel tubing in 1933 exceeded 70,000 tons, this not including pressure tubing. While figures showing the output last year are not available, it is conservatively estimated that 1000 tons of welded tubing was consumed in the manufacture of furniture.

Two grades of steel are used in making tubular furniture, a high-carbon steel rerolled from old rails used in furniture having a rough finish and a steel lower in carbon used for tubular members commonly finished with chrome plate. Steel tubing manufacturers are bringing out another grade of steel tubing with a high manganese content which will be used for making tubular furniture. This steel will permit the use of lighter tubing in making furniture without any decrease in strength.

Tubular steel lends itself to simplicity in the design and construction of furniture. Starting in this field as a material for garden and porch furniture, it is now used for chairs, tables, stands and stools throughout the house. Styling artists have developed many new and artistic designs in tubular furniture. In this case it might be mentioned that flat strip, chrome plated either separately or in conjunction with tubular sections, is now also being used in the manufacture of metal furniture. Tubular furniture likewise has become popular for use in beauty parlors, cocktail bars and for various other purposes outside of the home.

A new application of mechanical

tubing is for seat frames for railroad cars. In fitting up the coaches of a New York, New Haven & Hartford passenger train recently, 60,000 ft. of 16-gage stainless steel tubing was used. Weight was reduced one-half by substitution of the tubular steel. Tubing is also being used for bus seat frames to reduce the weight.

A tubular steel automobile frame, a most radical departure in the motor car field, has just been developed by the Midland Steel Products Co., Cleveland, in connection with the Leaf Spring Association. Weight is materially reduced in the tubular frame as compared with one of conventional design. Production of this frame awaits its adoption by some automobile manufacturer.

Another new use for mechanical tubing is for gas stove frames. The tubular design has been adopted by the American Stove Co. and in a few weeks stoves with tubular legs will be seen in the store windows.

Mechanical tubing made of high-carbon steel was used for head and foot rests for 152,000 metal cots recently purchased by the United States Army for the camps of the Civilian Conservation Corps and it is expected that an order for 300,000 more of these cots will be placed.

For heating Ford automobiles a new type of hot air heater taking 22 ft. of tubes has been placed under production. The tubes are arranged somewhat similar to tubes in a boiler.

One of the new uses developed for mechanical tubing during the past year which is taking considerable tonnage is for frames for a car loading device for automobiles, the use of which increases the number of



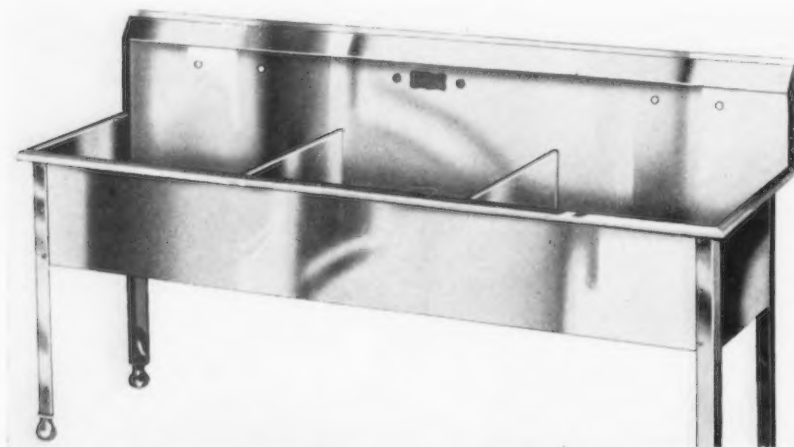
"INCANDESCENT monuments to man's mastery of steel," murmurs Arcturus, as he sees the glowing ingots emerge from the ingot molds. And it is difficult for his Earth guide to convince him that two mere human hands manipulate the gigantic grasp and movement. "Here are the beginnings of skyscrapers and battleships, of fish hooks and of frying pans," he is told. "This is where steel first takes form; it is the birth of steel with the crane man as midwife. The furnace has labored and brought forth sons who will soon go to the four quarters of the earth to labor in turn for mankind."

automobiles that can be loaded into a freight car.

Field of Welded Rolled Steel Broadens

The field of rolled steel is steadily gaining through the adoption of built-up structural members and stamped steel parts fabricated by welding. Developments in the art of welding and improvements in welding equipment have exerted their influence in causing manufacturers of metal products and fabricators to change to rolled steel. Where reduction in weight results in an improved product and where strength is an essential factor welded rolled steel construction is being used for an increasing number of products, many of which, it is claimed, can be made more economically of welded steel than of other materials.

Many machine tools are now of welded steel construction. However, makers of machine tools making tools in quantities or makers of tools requiring weight and high rigidity or of tools which necessarily have beds of rather intricate design have not yet become convinced that a change to welded frames is desirable. Manufacturers of power presses are turning to the use of welded steel frames, (CONTINUED ON PAGE 248)



THREE-compartment sink made of stainless ply steel of lock seam and welded construction.

Washington, in Prospect And Retrospect

*With Particular Emphasis Upon
Its Effect On Our Industry*

By L. W. MOFFETT
*Resident Washington Editor,
The Iron Age*

• • •

WOODROW WILSON was a *raconteur par excellence*. He took great delight in telling stories, and his hearers were always brought under his charm. Dialect, inflection, gestures and atmosphere were all subtly interwoven with a polish and shading which invariably brought forth a *bon mot*. The World War President was indeed a man of serious mien and often, of austerity. But he also possessed a fine sense of humor such as has not been associated with him in the popular mind. Frequently he turned to story telling to illustrate a point, and in this respect he has been likened to Lincoln. Though far from being as gregarious as his successor, Warren G. Harding, Wilson was by no means an ascetic.

During Wilson's first term, a certain program was laid before him. It was not clear to the President. It reminded him, he said, of the story about the man who realized his lit-

erary shortcomings and aspired to improve them. A sympathetic friend, desiring to encourage the ambition, thought the best way to start the aspirant on the way to his goal was the development of a greater vocabulary and accordingly presented him with a dictionary. A short time later the donor met his friend.

"Well, how do you like the dictionary I gave you?" he asked.

"It is very interesting but rather disconnected," was the response.

Looking back over the New Deal one can't escape a like conclusion. One of its critics, quite distantly removed from the charmed circle, has spoken of the program as "organized chaos." Interesting it has been and is, but extremely difficult to understand—to put together coherently.

Government by Experiment

Plans without end have been tried. Some were continued, others were found wanting and either scrapped or revised. Others proposed and studied are of a tentative character only. They make a dizzy zigzag course which seeks to lead to recovery and the end of a devastating five-year depression. Economic planners within the Administration have often differed with resulting unfavorable publicity. But the New Deal is not alone in its confusion over the handling of the tremendous problems.



DONALD R. RICHBERG is considered the President's No. 1 advisor when industrial matters are under discussion. Business men have begun to admire his frank attitude and sound viewpoint on many subjects.

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Like differences of opinion are to be found in industry, finance and agriculture, and organized labor, seeking desperately to build up its power, often has its own domestic troubles.

Yet responsibility for the way out rests with the New Deal. It has been especially emphasized by the overwhelming Democratic majority in the new Congress. Though many members bear the Democratic label and got into office under the New Deal banner, included among them are some of decided liberal views, ready to press all sorts of freak legislation. With the left wing blocs they make up the most radical American Congress of all time.

Great faith is placed in the popularity and power of President Roosevelt to prevent Congress from running rampant in an orgy of tremendous expenditures, inflation, and weird panaceas. Differing schools of political analysts have sized up the possibilities and reached varying conclusions. The predominant view is, however, that the President will generally have control of Congress, but will have to resort to the veto occasionally to head off radical measures.

Investigations Will Flourish

It is certain that the new Congress will enter upon all sorts of investigations, perhaps on a scale never before approached. It will go over the



JAMES A. MOFFETT, as Federal Housing Administrator, will be charged with the direction of one of the Administration's soundest plans for industrial rehabilitation.

numerous alphabetical agencies with a view to overhauling them, most thoroughly in some cases. This is one reason for the hurried efforts of the Administration to coordinate Government agencies. This gigantic job has been assigned to the National Emergency Council headed by Donald Richberg, who is known as the Administration's No. 1 man. The Administration wants to bring about as much coherence as possible in the New Deal program. It wants to head off excessive tinkering and lambasting at the hands of Congress, or rather by those in Congress who are often "offside," such as Senators Borah, Nye, Norris, Cutting and LaFollette.

Plans to establish order within the vast Governmental agencies, with their enormous powers of dictation over business and industry, were stepped up after the November elections. Business and industry had become increasingly concerned about the cross purposes of the different Gov-

ernmental bureaus. Likewise, growing apprehension over huge expenditures had become evident. There was also a tendency within the Administration partially to shut off the spigot, and to give a more attentive ear to the manufacturer and banker. Often before, a reluctance to heed suggestions from these sources was evident, but encouragement was found in the fact that the "brain trust" had been quieted to some extent.

It remains to be seen how far cooperation between the Administration and business may go, but considerable



THE public was somewhat surprised when Francis Biddle, of the Philadelphia Biddles, began his career as chairman of the National Labor Relations Board by taking legal action against the Houde Engineering Corp'n. He is apparently anxious to test the powers of his board in dealing with labor matters.

headway in this direction was manifest at the November meeting of the directors of the Chamber of Commerce of the United States. While at odds with the Administration on many phases of its economic program, the Chamber reflected the attitude of business in a desire to adjust itself so far as possible to the Roosevelt policies, just as industrial leaders had done in conferences at Hyde Park and at the White House.

The election disclosed clearly that the President has retained his popularity with the country. Many have expressed the opinion that he will be reelected. Much depends on what the Administration may do within the next two years to bring about recovery by taking some 17,000,000 people off the relief rolls, returning some 10,000,000 workers to factories, paring down expenditures, balancing the budget in the face of a \$29,000,000 Federal debt, holding the radical inflationists in check and keeping the extreme demands of organized labor within bounds.

Cooperation Indicated

That the Administration has developed a more lenient attitude toward private business has been indicated by the President's appeals for cooperation with the Government and for a truce with labor. Mr. Richberg has also urged private industry to take up the task of reemploying idle workers. Unless it does so, he has suggested that the Federal Government will undertake to bring this about, "either



SENATOR WILLIAM E. BORAH can be counted upon to continue as one of the Administration's severest critics. He is particularly opposed to NRA policies and may be expected to fight the basing point system in the steel industry.

directly through underwriting private activities or indirectly through the expansion of self-liquidating projects." Like appeals have come from Secretary of Commerce Roper and other Administration officials. Mr. Roper, however, has favored cooperation between business and Government from the outset.

The more sympathetic attitude toward private industry is apparently directed particularly toward the durable goods manufacturers, long ignored in their appeal for Administration cooperation. Various measures to help these industries have been considered, one of which is the housing program, although its importance in stimulating such lines as steel and machinery probably will not be so great as many proponents of the program have estimated.

The housing program, nevertheless, is hailed as a real help and entirely sound economically. But, as in other projects, cross currents developed. Harold L. Ickes, administrator of public works, reflected ideas on a building program far from those of James A. Moffett, Federal housing administrator, and the sharp differences between the two were checked only after President Roosevelt interfered personally and indicated that the public works program will not compete with private enterprise in the housing field. He has had to stop other rows among Administration officials in the same way.

Help for Durable Goods Industries

Mr. Ickes went on record in favor of a Government small home building program with no down payment and a 3 per cent interest charge, claiming that private industry charges excessive rates. Mr. Moffett replied that Mr. Ickes' program would most decidedly impair his agency and furthermore "would knock the packing out of the existing real estate structure in this country." The President has been represented as favoring continuation of a slum clearance program and the building of houses with Government funds for those not financially able to build. The Ickes program would go much further in eliminating private building activities. The result may be that Mr. Ickes may not get such huge PWA appropriations from the new Congress as he had hoped.

It is likely, however, that Congress

o o o
 WHEN Gen. Hugh S. Johnson resigned as head of the N.R.A., he turned over the reins to S. Clay Williams, who is now chairman of the National Industrial Recovery Board. Mr. Williams is not in the limelight as much as his predecessor.
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will be asked for a huge PWA fund amounting to as much as \$5,000,000,000 or even \$10,000,000,000. The actual appropriation asked for by the Administration will be much less than the former figure. It will be used, not alone for building, but to aid the durable goods industries in such ways as the continued lending to railroads for equipment purchases. Incidentally, security requirements may be relaxed in order to encourage the railroads to come into the market for equipment to be financed with PWA funds.

Conflict and confusion also enter into methods for aiding the durable goods industries. Consideration has been given to a plan to guarantee manufacturers against loss with the understanding that they would step up production greatly. The idea is to provide employment. Another plan would call for the Government underwriting a huge building program. Still, another would permit deductions from corporation taxes for plants increasing production and reemploying idle workmen. There also has been discussion of a proposal that the Federal Emergency Relief Administration encourage States to put unemployed men at work turning out

goods for use by themselves and others without jobs.

Thus numerous plans are suggested as the Government faces the problem of vast relief requirements. The basic idea, however, is to put men to work earning money and thereby cut down on the dole. It has only encouraged indigence on the part of those who actually do not want to work and broken down the morale of those who do. The tremendous demands for relief are indicated by the fact that the FERA was compelled to turn to the Reconstruction Finance Corp. for money to carry it through November, and will require additional funds before further appropriation can be obtained from Congress.

The plan of Fred I. Kent, New York banker, providing for a Government guaranty against loss to manufacturers for stepping up production and increasing employment has the support of the American Federation of Labor and some industrialists. The plan would be carried out through the NRA, the RFC and the Federal Reserve Bank and has been outlined in considerable detail. Inevitably, opponents have said, it would lend itself to absolute Government control,

despite the good intentions of those proposing it. Similar objections have been raised to other subsidy plans which are new to the Governmental and economic systems of the United States. Other proposals have met with the objection that they would be difficult to administer by the Government. On the theory that large savings in relief costs would be realized, Harry L. Hopkins, relief administrator, has suggested the idea of bringing together idle workers and idle factories and surplus materials, a proposal some have criticized as being similar to Upton Sinclair's EPIC idea which was blasted by the California voters.

Can't Spend Way to Prosperity

The spending program, of course, has held the upper hand. It still does. But the theory of spending the country to prosperity has been tested and proved ineffective and the Administration is turning from it. At least, it is modifying its views and depending more and more upon the old-fashioned methods of private initiative. However, Marriner S. Eccles, newly appointed governor of the Federal Reserve Board, is a strong advocate of Federal expenditures so planned as to encourage private spending. It is his theory that every Government dollar spent for building should stimulate the expenditure of four or five individual dollars. The basis of his conception is that the Government should subsidize the building of homes by way of reduced freight rates on building materials, making up the difference to the carriers.

Organized labor is insisting upon the 30-hr. week, holding this to be the best method of all to reduce unemployment. The Administration is opposed to it. Industry obviously is strongly opposed and sees in the 30-hr. week the quickest way of shutting down plants and greatly increasing unemployment.

The many plans plainly indicate the anxiety over the unemployment situation and the continued lag in industry, as well as over Government credit. It is realized that the Government cannot endlessly continue direct relief expenses of approximately \$1,500,000,000 a year and that it should balance the "ordinary" budget at once, if at all possible, and devise means for balancing the emergency

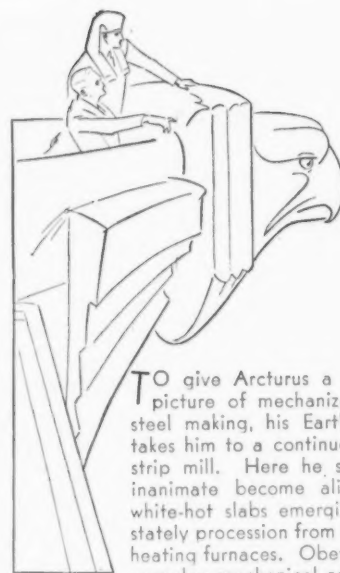
budget over a term of as few years as possible. Otherwise, it is seen that the proponents of uncontrolled inflation will become a serious menace.

The new Congress will show great inflationary strength just as it will show great bonus strength. The Administration is girding itself strongly against the former and apparently prepared to yield to the latter only by direct payment of a bonus with definite means to do so and then only to veterans wounded in or invalidated from actual service. It is confronted, however, with a demand for a bonus-for-all program involving some \$2,200,000,000. There is also a strong demand for paying off farm debts. When it is considered that different blocs might amalgamate to push through their demands, it is recognized that the Administration will have a real problem in forestalling legislation which would lead to the utter collapse of Government credit. Even at the last session of Congress the bonus bill went through the House by a two-thirds majority. It failed in the Senate. It will probably have stronger backing in both houses in the seventy-fourth Congress and the same likely will be true of the 30-hr. week bill.

How to Stimulate Foreign Trade

The situation is made more difficult by the lack of cooperation within the Administration, a matter which has been receiving Presidential attention with good effect. But it is a question as to whether all the differences can be ironed out. The recent embroilment over housing did not set a precedent.

Secretary of State Cordell Hull and George N. Peek, foreign trade adviser, have differing views on building up export business. The Secretary urges the most-favored-nation clause in all reciprocal trade agreements. Mr. Peek wants to make individual bargaining agreements and to scrap the most-favored-nation clause. He contends that the failure of the United States to maintain its foreign market is due to "a school of international altruists" who still believe in free trade as a means of raising living standards in all the world. He also has criticized "another school of thought in this country which seems to feel that money should dominate trade," and has declared that, while money is a measure of value, it is not



TO give Arcturus a colorful picture of mechanization in steel making, his Earth guide takes him to a continuous hot-strip mill. Here he sees the inanimate become alive; the white-hot slabs emerging in a stately procession from the slab heating furnaces. Obeying the unspoken mechanical command of "column right!" he sees them change direction apparently of their own volition and one by one enter the first of the long series of roll stands which form the continuous mill. With amazing speed, he sees the slab become a flying colorful ribbon of steel running the color gamut from white through shades of yellow and red to black. Finally, he sees the longitudinal movement become a rotary one as the metal ribbon enters the coiler and is wound upon its spool.

a constant one and should not be allowed to become the "master of trade."

Mr. Peek believes recovery can be facilitated by foreign trade outlets. He favors Government assistance to exporters, such as is provided by foreign countries, including subsidized exports and export guarantees "to meet competition in the particular countries in which we sell." He also believes in the adoption of a two-price system for some commodities, one for domestic and one for foreign consumption; revision of the unconditional most-favored-nation policy to permit working of a system of selective imports and exports supported by fees and quantitative restrictions on imports as a "safeguard to balanced American economy," and in the adoption of two-column tariff and import quotas to make possible preferential treatment of given commodities from countries providing the best outlets for American products. He would tie together all Federal agencies having to do with foreign trade, maintain up-to-date records on American balances of international payments

and provide Government cooperation and direct action to "clean up our exchange problem."

With respect to the agricultural program, Mr. Peek bluntly declares that "we must either increase our sales of agricultural products in foreign markets or continue to reduce farm production." The latter plan, if put into effect by the Department of Agriculture, Mr. Peek says, would mean distortion of population, unemployment, social unrest and increases in bread lines in cities. Mr. Peek's inability to agree with AAA planners was the cause of his leaving a berth in that alphabetical agency and being transferred to his present position.

Uncertainty in Labor Policies

Gen. Hugh S. Johnson, now faded from the picture as the stormy, dominating administrator of the NRA, is said to have differed sharply with his chief counsel, Mr. Richberg, over NRA policies. Now the latter, a former organized labor attorney himself, is being criticized by organized labor because his views do not entirely match those of the National Labor Relations Board as they relate to the famous Section 7A. The board laid down the principle in the Houde Engineering Corp'n. case that the union representing the majority of workers in a plant has the exclusive right of collective bargaining. Mr. Richberg goes along with that view but holds that workers not participating in an election are not bound by agreements made through such an agency. The Houde case is being prosecuted in the Federal District Court at Buffalo.

The principle laid down by the National Labor Relations Board in the Houde case was outlined by the President himself in his executive order creating the National Steel Labor Relations Board. The former board took the actual terms of the President's order in expounding the principle. It is therefore accepted as the Administration policy with regard to collective bargaining, though the "proportional" representation plan had been laid down by the President in previously setting up the National Automobile Board.

The American Federation of Labor is strongly in favor of the majority representation plan and is making strenuous efforts to break up the National Automobile Board with a view to substituting the broader policy specifically stated in the Houde case

by the National Labor Relations Board. Labor has also vigorously opposed the Richberg opinion that non-participants in an election are not bound by collective bargaining agreements made by the majority. It seeks to go further and bar individuals or a minority group from presenting grievances or conferring with employers or otherwise associating themselves and acting for mutual aid or protection. These rights are specifically provided for under the executive order establishing the National Steel Labor Relations Board.

Organized labor was also much aggrieved by the recent speech of Secretary Roper when he declared that the right to strike must be accompanied also by the right to work. This talk, which may or may not have been an Administration "trial balloon," was interpreted by some as indirect advocacy of the principle that unions be incorporated, just as industry is, and made responsible for acts of violence which have been so frequent in the past year. But organized labor does not want any more Danbury Hatters' cases.

All of these points will have a bearing on legislative policy. Organized labor has announced its determination to strengthen Section 7A, evidently intending to try to force through its views as to majority representation and make itself the exclusive agency for collective bargaining. It also hopes to compel industry to submit to demands of the labor boards for payrolls when elections are ordered. This latter effort has been an important factor in hearings of the National Steel Labor Relations Board on complaints from the Amalgamated Association of Iron, Steel and Tin Workers as it drives for widespread unionization of the steel industry. It is evident, however, that the association has been goaded to more extreme views by President Green of the American Federation of Labor. Since the association has gone "vertical" the influence of the parent body has become much greater than in the days when the association was a craft union of highly skilled workmen. Its cohesiveness also has been lessened by the radical elements which have grown up within it.

Refusal of organized labor to accept the truce which the National Steel Labor Relations Board sought between the association and the indus-

try was directly due to interference of Mr. Green. Association officials are said to have stood ready to accept the industry's offer to recognize and deal with union leaders in their official capacity. However, industry did not agree to sign union contracts or deny non-union workers the right of their own representation.

Wagner Bill Will Come Up

In its efforts to give labor boards power to compel the submission of payrolls, a matter that may be of doubtful legality, organized labor apparently will find support in the Administration. This view is based on the statement of Francis Biddle, chairman of the National Labor Relations Board, that he will ask that the board's power be strengthened in that direction.

Organized labor also will attempt to revise the Wagner labor disputes bill, killed by the last Congress, and for which labor board legislation was substituted. Senator Wagner has said he will again offer such legislation which would abolish company unions. The measure was vigorously fought when it was presented at the former session and will be hotly opposed again.

Although Senator Wagner is close to the White House, it is not believed he will find Administration support for the measure. The Administration's efforts for a labor truce assuredly would suffer infinite harm through such legislation and it would doubtless create much additional labor strife.

There is also reason to believe that the White House has cooled considerably toward President Green and his constant "demands" for organized labor. It is reported that he sent to the White House a list of these "demands" as they emanated from the San Francisco convention of the federation. An assistant secretary is understood to have replied in a tone indicating resentment at the "demands" and stated that they would be presented to the "proper bureaus." This would seem as if Mr. Green had overplayed his hand.

The American Federation of Labor at the new session of Congress of course will strenuously advocate the 30-hr. week. The Administration is understood to be strongly opposed to the proposal and it is not thought that it can possibly be enacted. On the other hand the Administration has

urged shortening of hours and increases in wages. Industry reacted unfavorably to the President's suggestion at the general code authority meeting last spring that the work week be cut 10 per cent and wages be increased a like amount. Subsequently the pressure for an increase in wages was allowed to die down, but there still appears to be sentiment in favor of a reduction of hours.

Future of NRA

Speaking of plans for NRA, Mr. Richberg has laid down three general policies. First, he has said that "the purpose and principles of Title I of the National Industrial Recovery Act should be and will be carried forward into permanent legislation." He believes that capital, labor and public have reaped benefits from this experiment in industrial cooperation and orderly planning too valuable to dispense with. Many may disagree with Mr. Richberg or certainly fail to share his enthusiasm, but that does not alter the fact that what he says may become the law.

Secondly, Mr. Richberg has stated that the NRA or its permanent successor should operate with the greatest possible flexibility. It should apply, he has said, not only to code making, price and production control and supervision of trade practices, but also to labor regulation. It was made clear that the trial-and-error administration of the NRA has shown that arbitrary methods and inflexible rules cannot be forced upon all industries alike. Thirdly, he has stated that if agreements are to be upheld for employers they must be equally preserved for workers.

The American Federation of Labor likewise will ask for additional privileges under the National Industrial Recovery Act when it comes up in Congress for revision. Organized labor particularly has in mind asking for direct representation on the National Industrial Recovery Board provided the life of that board is extended. The general view is that organized labor already is well represented on the board but of course not by its actual officials. Labor also proposes to ask for representation and voting power on all code authorities.

Another change that may well be looked for in the recovery act, unless it is brought about by the recovery board itself, will be the elimination

of provisions for production control and machine limitation. To a lesser degree, there may be expected to be elimination of price control features which may be much more sweeping than prominent administration spokesmen have even indicated or desire. The Congress undoubtedly will take a hard swing at NRA because of such provisions and insist upon their modification in the overhauling of the entire machinery. Natural resource industries, perhaps, may be assured of price protection, but beyond them many doubt that it will be afforded. It must be remembered that there are certain influential figures in the Administration who oppose production, machine and price control provisions in codes generally, but feel that the natural resource industries should be given protection against ruinous price competition, which they hold is not as easily controlled as it is in the manufacturing groups.

The upshot may be that agitation to restore the anti-trust laws may make greater headway than is now realized, even though the Administration may prevent revision of the act to a point where industry would no longer be interested in codification. With price protection entirely withdrawn interest of most industries probably would sink to a low level.

Resentment at Bureaucracy

It is clear that the Blue Eagle has lost much prestige. It inevitably signifies the bureaucratic control of the Government over business, and if it is to be plucked much more, its death might be witnessed without great mourning on the part of industry. Especially would this be so if industry is to be constantly heckled

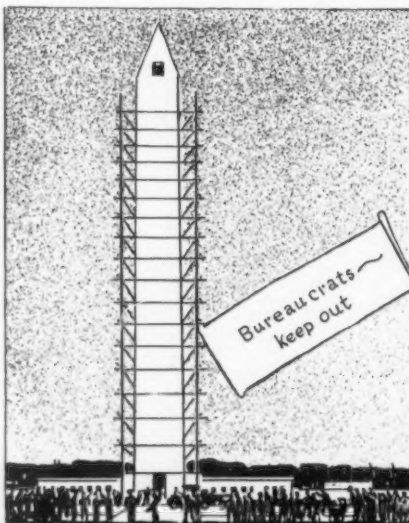
by labor and if Governmental bureaucrats, swollen with their brief authority, continue to jail every pants presser who puts in creases at a rate of 25c. instead of 30c. a pair.

Industry, of course, is itself responsible for much of this bureaucratic control. But it little realized when it sought greater freedom for cooperation that the Government would take such a tight hold of its affairs as it has done and will continue to do so long as it can. "Dictated economy," which has been shown to be as old as ancient Egypt, is proving costly to private initiative, or to "rugged individualism."

"Rugged individualism," of course, has been the object of scoffing by the most rugged of rugged individualists within the New Deal. No previous Administration has had such an abundance of these hardy souls. This may explain in part the many rifts within the official household with its numerous family of some 680,000 on the payroll of the executive branch alone. In Washington itself are some 93,000, who are more or less busily engaged in running business and industry. They are wedged in almost every crevice available. It is not true, however, that workmen are lifting the face of the Washington Monument, and have encased its entire length of 555 ft. in a steel corset, in preparation for having still another Government bureau move into that historic shaft. Even though the broad expanses of the White House lawn have been diminished by additional executive offices, the Washington Monument and the Lincoln Memorial, by reason of cherished tradition, have withstood the bureaucratic invasion.

The NRA has become so unwieldy and complicated that efforts are being made by the recovery board to decentralize it and to give greater uniformity to codification. These efforts may be spurred by Congress. Indeed it is conceivable that the board may be entirely discarded and that the NRA, like Gaul, may be divided into three parts, and apportioned among the Department of Commerce, the Federal Trade Commission and the Department of Justice. Or it may be cut into only two sections, and divided between the departments of commerce and justice. For the merry under-cover scrap between the trade commission and the Department of Com-

(CONCLUDED ON PAGE 239)



COMBINES are now being used in hilly country. The tractor is powered with a Diesel engine.



AT the approach of winter adequate rains had fallen throughout most of the drought areas of our agricultural States. Disbursements by the AAA had more than offset disadvantages arising from operation of the National Industrial Recovery Act. Money obtained through Government agencies had vastly improved the credit position of the farmer. His floating debt had been reduced, his interest rate on long-time paper had been cut and his major obligations had been extended. At the same time, the unfilled replacement percentage of farm machinery had risen to a new high; old models and machinery in the hands of dealers and distributors had approached an all-time low, and improved designs and a wider range of sizes of machines, which broaden the manufacturer's field, had been offered on the market.

With a full appreciation of these facts, it is not difficult to foresee a year in which farm equipment manufacturers will at least hold, if not exceed, the level of activity established by the capital goods industries generally. Consumption of iron and steel and the purchase of machinery by farm machinery builders seem destined to increase during the next 12 months.

Probably the biggest "if" in any

The Farmers Have Money to Spend For Equipment

By ROGERS A. FISKE

Western Editor, The Iron Age

forecast for the new year is what nature will do. It is pointed out that conditions such as prevailed last year in the prairie and some of the mountain States seldom occur two years in succession. Furthermore, rains, which started late in August, 1934, came with satisfying regularity and volume so that freezing weather found the soil in good winter condition in most areas. In general, opinion leans strongly to the view that drought need not be anticipated in 1935.

The effect of the 1934 drought on machinery sales is well illustrated by the fact that about 36 per cent of all the farm implements and machinery in the United States was located in the emergency drought areas. Assuming territorial sales distribution on the basis of existing equipment, then machinery manufacturers had expected to find 36 per cent of their 1934 sales in the drought area. Also another 14 per cent was expected from territory where the drought was

not so severe. With nearly half of the sales territory in distress it was natural that much potential volume was lost in 1934. Repetition of this condition is not expected by the trade in 1935. In fact, with the surplus of farm products at the vanishing point, there is reason for farm experts to say that the farmer's outlook is the best in five years.

Farmers Reduce Debt Burden

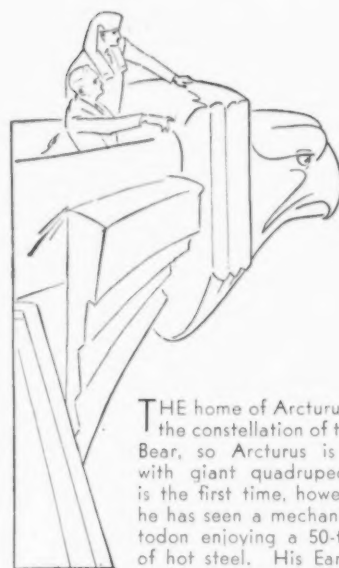
All last summer and fall, manufacturers could not understand why their sales did not bound up when processing taxes and other Government aids were being extended to the farmer. That story can now be rather accurately told and explained.

Most of the 1934 net farm income went to finance indebtedness, which after all is a curative step and should be strongly reflected in the 1935 commodity purchases for use in rural areas. The farmer divides his indebtedness into two general classifications, floating debt and land or mortgage debt. In 1932 the farmers' floating debt was about \$3,500,000,000 and they carried, in that year, a land debt of \$9,500,000,000, both of which were pressing to the utmost. This is where the Farm Credit Administration lent a helping hand. In the FCA were consolidated the various agencies of the Federal Government which had been lending money to farmers. It took over the Federal Land Banks and the Intermediate Credit Banks, as well as several minor departments and some of the

functions of the old Farm Board. So far the FCA has not seen fit to consider newly purchased equipment as prime collateral to farmers' loans and to date the only direct benefit the manufacturer has had from the loaning ability of the FCA is in cases where the farmer has had sufficient prime collateral, of the type required by the rules, to borrow the money with which to buy a machine or to pay a debt. Farm implement manufacturers are still hopeful that new regulations will be made which will be less stringent, thereby enabling more farmers to enter the equipment market.

In the period from June 1, 1933, to Oct. 10, 1934, more than \$1,200,000,000 in debts were refinanced under the farm-debt refinancing program of the FCA. Out of this borrowed money the farmer paid to commercial banks, including those in the hands of receivers and conservators, the sum of \$320,000,000; to insurance companies \$150,000,000; to joint stock banks \$86,500,000; for payment of taxes \$36,500,000; to miscellaneous and unclassified creditors \$498,000,000; for purchases of land, equipment, construction and repair of buildings and other agricultural purposes \$67,000,000; and, for other purposes, such as redemption of foreclosed land, loan fees, etc., \$60,000,000.

In terms of a dollar borrowed the farmer gave 26.3c. to commercial banks, 12.3c. to insurance, 7.1c. to joint stock banks, 3c. for taxes, 4.9c.



THE home of Arcturus adjoins the constellation of the Great Bear, so Arcturus is familiar with giant quadrupeds. This is the first time, however, that he has seen a mechanical mastodon enjoying a 50-ton meal of hot steel. His Earth guide explains to Arcturus that the huge ingot forging press, with the help of the crane suspended manipulator, is not eating the glowing metal but is kneading it into a refined and homogeneous ingot forging bar. "Perhaps," he tells Arcturus, "it is destined to become a rotor shaft for some yet unborn steam turbine, or the propeller shaft of a battleship."

for miscellaneous purchases including foreclosed land, 5.5c. for equipment repairs, etc., and 40.9c. to miscellaneous and unclassified creditors. The grand total as given above was well over \$1,200,000,000, but this figure does not tell the entire story for the reason that in arranging payment of many of these debts there was a write-down of the principal amount, so that the farmer has also gained from that point of view. By borrowing to meet old obligations he has actually been able to reduce his total indebtedness.

Increase in Cash Income

Now, then, he has had another means of reducing his debt burden and thereby improve his credit standing. His cash income has increased and with that has also come increased purchasing power by a widening of the spread between prices received and prices paid. Cash income from sale of farm products, AAA rental and benefit payments, and from the emergency sale of cattle to the Government amounted to \$662,000,000 last September and \$581,000,000 in August compared with \$554,000,000 in September, 1933. Income for the first nine months of 1934 has been estimated at \$4,313,000,000 com-



THIS hay baler can be used at the hay stack or it can be used in the field to gather and bale the hay without the necessity of stacking.

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pared with \$3,479,000,000 in the same period of 1933. This is an increase for 1934 of \$834,000,000.

Farm Dollar Is Worth More

In September the farmer's dollar was worth 79c. whereas in September, 1933, it had a value of only 69c. Using the period 1910-1914 as an index of 100, the farmer's dollar in 1932 averaged 61c., and in 1933 it averaged 64c. About October, 1934, it reached 100c., or in other words, on about that date the purchasing power of the farm dollar returned to the average of the years 1910 to 1914. Due to this increase in the value of the dollar the farmer has been able further to reduce various obligations and further to increase his credit position and so place himself in a strong position to become a substantial buyer in the open market, especially when crop receipts start flowing to him in the new year.

Farmers have had another advantage come to them. By reducing debts by means of increased income, loans from the Government, lower interest rates and scaling down of debts that were refinanced, they have cut down their annual interest burden by fully 16 per cent. To show the importance of this, it should be noted that the farmers' interest burden in 1933 amounted to about \$568,000,000. They have still another advantage and that is that all loans are amortized, so that today farmers, unless they choose otherwise, are free from pressing debt, at least debt of the size that will force foreclosures.

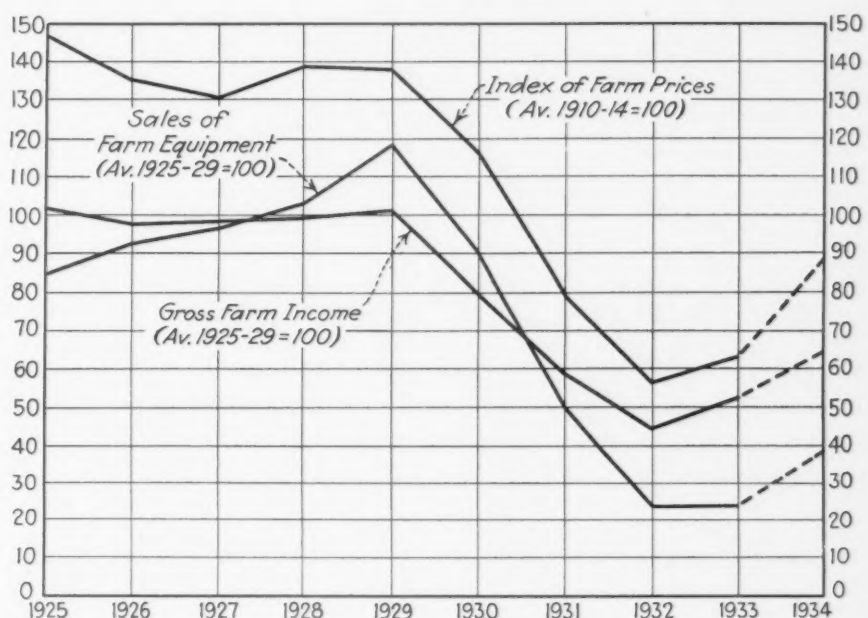
Higher Prices Prevented Losses

A key to 1935 is given by the fact that, though crops yields in 1934 were reduced, higher prices to the farmer stopped the loss that he otherwise would have incurred. Last year, 1934, there were decreased yields of all crops except winter wheat. The Nov. 1 crop reports indicated that the 1934 corn crop was husking out lower than estimated earlier in the fall. However, notwithstanding this, prices as of Sept. 15 stood at such a high level that in dollar value the 1934 crop, based on Oct. 1 crop estimates, was fully equal to the 1933 crop. The 1934 wheat crop, estimated as of Oct. 1, dropped 127,000,000 bu. below 1933, but prices as of Sept. 15, 1934, had risen 21.1c. per bu. to 92.2c., bringing to farmers an

increased income of \$83,000,000 in 1934 as compared with 1933. The same situation holds true for oats, on which the yield dropped 186,000,000 bu., but prices rose 18c. to 50.3c. a bushel, thereby increasing the 1934 gross income on the crop by \$38,000,000. The drift of farm prices is indicated by comparisons of August and September, 1934, quotations. In September, price levels had risen for corn, wheat, hay, oats, beef-cattle, hogs, eggs, butter and veal calves. Prices were lower on potatoes, butter fat, wool and lambs. Cotton quotations were unchanged.

that the only way to force prices up, or to hold them near present levels, is to curtail production and then depend on the law of demand and supply.

Statistics made available by the Bureau of Agricultural Economics, United States Department of Agriculture, show that on a per capita basis there has been a gradual decrease in gross agricultural production since 1920. In that year, American farmers planted about 96 acres of corn per 100 population and in 1933 they planted 82 acres. In the 1920-1932 period wheat acreage dropped



SALES of farm equipment, farm income and farm prices all turned upward in 1934.

The importance of this price situation is that the crop outlook for 1935 is good and, therefore, yields are expected to be good. Furthermore, opinion leans solidly toward price levels that will not vary materially from current quotations. However, should prices drop moderately, it is expected by those in close touch with the farm situation that the crop yield will bring to the farmer in 1935 a far higher income than he enjoyed in 1934.

Downward Trend in Production Per Capita

Extension of the AAA program in one form or another seems assured for 1935. This program is based on the theory that overproduction has existed in American agriculture and

from 59 acres to 46 acres. From 1920 to 1933 cattle dropped from 66.5 head per 100 population to 52.3. Hogs dropped from 56 to 48.9. The trend of all livestock has been from an index of 100 in 1920 to an index of 84 in 1933, a decrease of 16 per cent. Only sheep showed an increase. From these figures it would seem that the trouble is due partly to the loss of export trade, which in the case of wheat is only 43 per cent of the 1910-1914 normal. What the future trend will be is uncertain. Developing or regaining foreign markets is a serious problem, and even domestic consumption is variable and unpredictable. Records show that domestic disappearance has dropped from one year to another as much as 57 bu. per



MECHANICALLY picking and husking two rows of corn at a time.

100 population from a top of 489 bu. per 100 population.

The Horse Has Not Come Back

The old controversial horse situation needs a new review if one is to attempt to look forward into the farm implement market. An important phase of this problem is the comparative age of farm horses in 1926 and 1932, a study of which has been completed by the University of Illinois. The number of farm horses declined from 19 per 100 population in 1920 to 9.7 in 1933. Not only is this decline important, but it must also be recognized that these horses are getting older every year. In 1926, 69 per cent of the horses were under 12 years of age and only 31 per cent were over that age. In 1932, 55 per cent were under 12 years and 45 per cent were over. Therefore, there is not only a decrease in the number of horses on farms, but the efficiency of those remaining is being cut by advancing age. This means that every year more farmers must turn from animal power to mechanical power and therein accrues added benefit to farm implement manufacturers and tractor builders.

There has been much talk in recent years that might lead one to believe that the horse is coming back and that, with increased demand for horsepower, breeding has been stimulated. The facts of the matter are the horse

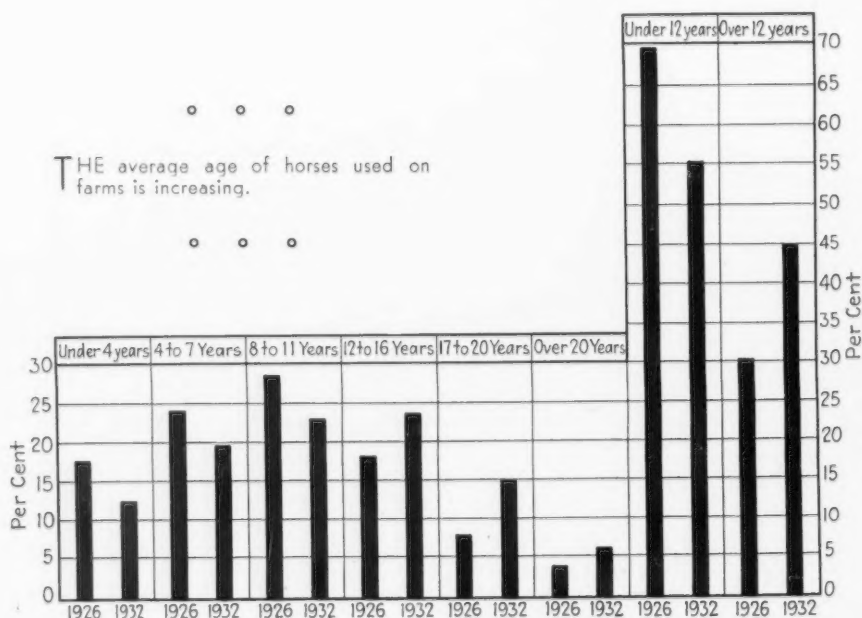
will continue to decrease in numbers because there is an actual shortage of breeding mares and because a large number of the mares of breeding age cannot be spared for that purpose by the farmers. Many farms now worked by horses have, for the sake of economy, or by necessity, limited the number of horses to the point where spring work dictates that all heads be used for work, and that is the time when mares, if bred, cannot be worked. This point can be well illustrated by a farmer who,

visualizing profits, bought a stallion after having been promised by neighbors that they would breed 63 mares. With the stallion at hand only 10 mares were actually bred, the other 53 having been kept for work.

An accepted figure is that there are now on farms a total of 12,000,000 horses. Forty-five per cent of these are over 12 years old; therefore about 7,000,000 are under that age. One-half of this number are males, and 12½ per cent of the remaining 3,500,000 mares are less than four years old and cannot be bred. Therefore there are not more than 3,000,000 mares than can be bred, and probably two-thirds of these are worked from early spring through the harvest season. By way of comparison, it should be pointed out that four good horses, two sets of harness, four collars, four blankets and four halters cost as much as a one-plow tractor.

Disadvantages of Short-Week Program

For over a year farm implement manufacturers have been busy setting their house in order and taking advantage of all opportunities as business volume slowly gained momentum. A code was adopted which allowed a 40-hr. week, averaged on a six months' basis, with 10 per cent tolerance for peak loads and seasonal demand periods. There are no restrictions on hours of labor in cases of emergencies



further than that the hours must be averaged to 40 per week during the six months' adjustment period. There also are provisions relating to the employment of women, youths, apprentices and superannuated workers. The minimum rates of pay for shop workers are 30, 35 and 40c. an hour, according to the zones in which they are employed, and for office employees the rate ranges from \$12 to \$15 per week according to the population of the towns or cities in which they are employed.

The effect of limitation of hours upon this industry cannot be gaged accurately because few, if any, plants have found it necessary to operate at capacity. It did hamper some employers last spring when an actual shortage of tool and die makers developed, and several members of the industry were unable to launch new production programs as promptly as would have been the case had they been permitted to work these departments longer hours.

Increased Demand Expands Employment

It was the purpose of limited hours of work to create new employment, and it has accomplished this to a small degree in this industry. Surveys made by the Research and Statistical Department of the Farm Equipment Institute show that there was an increase of 75.4 per cent in the number



CORN binders are becoming increasingly popular.

of shop employees between June, 1933, and June, 1934. Of this increase, 32 per cent was due to short hours of work, and 43.4 per cent to increased demand for products.

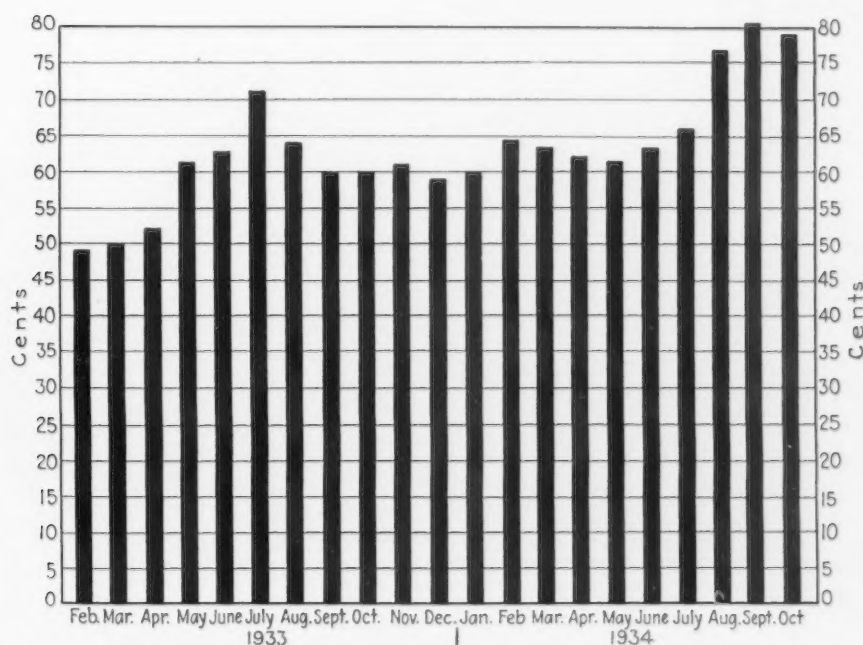
Establishing minimum rates of pay has not worked any great hardship because the rates actually paid prior to the approval of the code exceeded the minimum prescribed for most plants. In August, 1933, the latest

date prior to the approval of the code for which data on rates of pay are available, the average hourly earnings were 50.6c. per hour, which was 86.8 per cent of the average rate in June, 1929.

Weekly Earnings Curtailed

One effect of the code has been to curtail weekly earnings of shop employees. Shorter hours created employment for 10,500 persons, but this was at the expense of the 32,800 who would have had their jobs even if former hours were worked. Had shop workers in June, 1934, been permitted to work the same number of hours per week they worked in June, 1929, and had they received the average rate of pay actually paid in June, 1934, their weekly earnings would have been \$6.85 per employee more than they did receive. Thus, it can be seen that while some 10,000 persons found employment as a result of code hours, some 32,000 others sacrificed \$6.85 each from their weekly pay check.

Reduction in weekly earnings causes dissatisfaction among employees, while the failure of shorter hours to create as much new employment as was expected disappoints the proponents of the code idea. As a result, there has been, not only in this industry but in others, more or less agitation for higher rates of pay and



THE index of agricultural prices rose during 1934. The drop in October was the result of usual seasonal influences.

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at the same time a proposal from the Administration to reduce hours still further without reducing weekly wages. As of Nov. 3 employees at work equaled 58 per cent of the June, 1929, number, and they were working 44½ per cent of the number of hours worked by employees in June, 1929. The pay in November was 105.3 per cent of the June, 1929, rate. Much of this 5.3 per cent increase is the result of a larger portion of present employees being in the highest schedules offered by the industry.

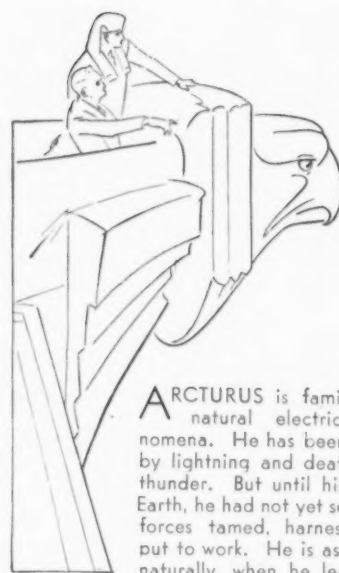
Implement Makers Fear Higher Costs

Farm implement manufacturers are giving close attention to moves that threaten to shorten the week and thereby increase the cost of their prod-

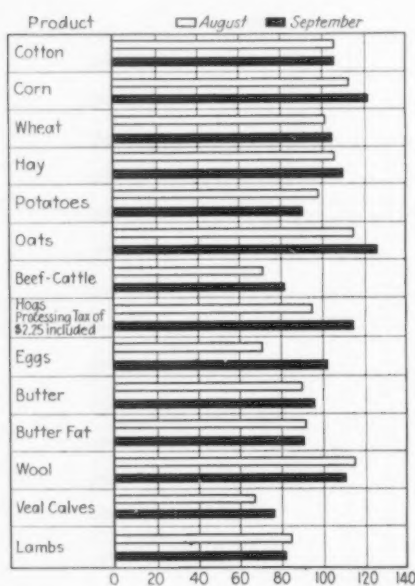
ucts. They operate on a comparatively close margin and they know the buying characteristics and practices of the farmer who, they feel, will not stand for a mark-up at this time. Remember that the farmer looks at the difference between price received and price paid, and his purchases will drop if the spread narrows.

Cost of doing business under the code, as well as higher material prices, have already forced equipment manufacturers to mark up list prices of the general implement line by 5½ per cent, and tractors are now 10 per cent above their low. The average for the entire line is 7½ per cent. However, this mark-up is not real to the farmer because he has had in the past year the opportunity to purchase bargains in old models and distress machinery. In all probability, the average price paid for machinery in 1934 by the farmer was lower than the actual list prices as catalogued. The sales records of some companies that had large inventories to liquidate show that their 1934 average price was lower than in the year previous. However, stocks are at a minimum, and these bargains are no longer available to the farmer. The industry does not want any move forced on it that will necessitate quoting higher prices to its farmer friends.

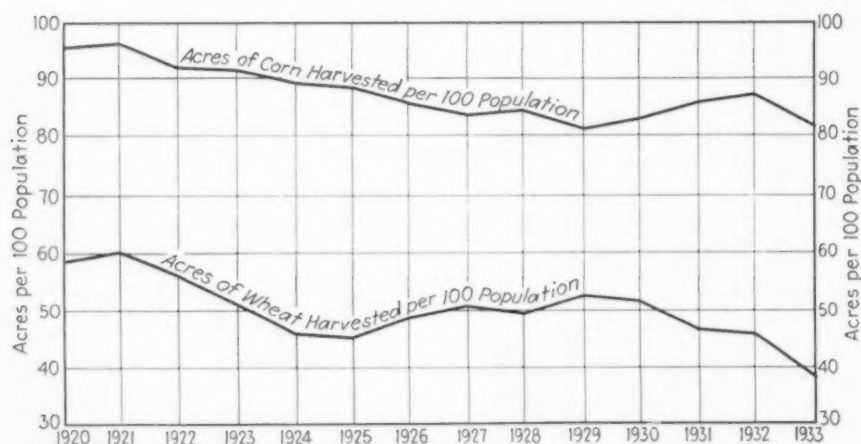
Despite the deplorable experiences of the industry in 1932 and 1933, both sales and collections were better in 1934 than in any year since 1931. Reports showed increased sales for the first eight months of 1934 of about 85 per cent over those for the corresponding period of 1932, and indicate



ARCTURUS is familiar with natural electrical phenomena. He has been dazzled by lightning and deafened by thunder. But until his visit to Earth, he had not yet seen these forces tamed, harnessed and put to work. He is astonished, naturally, when he learns that electricity is put to work through motors to make Earth's industrial wheels go round; more astonished still when he sees huge machines obeying the touch of a human finger through electrical control. It is hard, therefore, to persuade him to leave this strip mill with its complete electrical control; he is fascinated to note its instant obedience to its operator. He is almost tempted to ask permission to "try it himself."



RELATIVE prices of farm products in August and September, 1934, showed most prices were moving to higher levels.



BOTH the corn and the wheat acreages have tended downward since 1920.

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a total domestic volume of about \$185,000,000. This compares to sales of about \$120,000,000 in 1933 and \$117,000,000 in 1932. In 1929, the peak year, sales totaled \$458,000,000.

The Danger of Harmful Legislation

Reviewed briefly, favorable factors are: Fall rains were ample; likelihood of drought in 1935 is negligible; farm prices seem to be well stabilized; the farmer's dollar is worth more; the farmer's credit is vastly improved; and his needs and desires for more equipment are mounting. Equipment manufacturers and dealers are in excellent condition to meet the new demand. Employment is increasing as farmers buy more equipment. Foreign equipment buying is keeping pace with growth in the domestic market. Uncertainties lie in the direction of foolish and harmful legislation, and the caprices of nature. Of the two the former is looked upon by the industry as the one most to be feared.

Scanning the Legislative Horizon

*What Are the Prospects for Unemployment Insurance,
Old Age Pensions and the Thirty-Hour Week?*

By H. H. STANSBURY, JR.*

YESTERDAY, blessed with unparalleled prosperity, the mercurial people of this vast country were heralding the machine age; sagely and smugly they informed one another that, before long, they would work no more than ten hours per week. The machine was their assurance of prosperous leisure.

Today, many of these same people decry the machine as a Frankenstein. The vox populi now clamors for a guarantee of "man hours" or the equivalent. Economic security; unemployment insurance, old age pensions, health insurance, ad infinitum, the plans pour into Washington advocating everything that a group of self-styled Messiahs can concoct to gather a following. The majority of these would-be prophets would lead their lambs out of the wilderness by the very direct and simple method of paying them \$200 per month or more for the rest of their natural lives.

Disillusioned, the average humble layman makes neither head nor tail of these myriad fantasies but looks

THE prospects for so-called "social" legislation in the coming congress are of great interest and importance to industry. A majority in both Senate and House of the coming Congress is on record as favoring unemployment insurance. More than 61 per cent of the membership of the new House will support a 30-hour week bill. Unnumbered and as yet unknown bills will also be introduced covering other purported solutions of the problem of social security.

Inasmuch as industry will be called upon to pay a large part or all of the cost of these proposals, should they become law, it should be well informed concerning their nature, their status and the attitude of our law makers and administrators toward them. Therefore, we present, in the accompanying article, a broad study of these subjects. Its object is to give an unbiased factual picture of present trends of thought and future probabilities.

hopefully toward social legislation as the panacea which will remove 40,000,000 from relief rolls, help return 10,000,000 or more workmen to employment in industry and retire the aged to make way for the young.

Thus, the program of social legislation becomes not only the most important before the incoming 74th Congress but among the most vital and far reaching ever to come before any Congress.

Social legislation, as mentioned here, is concerned with various social insurance plans advocated and discussed for years by economists, sociologists, relief workers, and others similarly interested in the problem. The term "insurance" is in some instances, a misnomer. The majority of plans, whether operative or theoretical and whether concerned with unemployment, old age, sickness or accident, are based on the insurance principle; but some fall outside of the actuarial category. A slightly different form in the field of unemployment relief, which has received a great deal of attention, is founded on the premise of employment assurance through em-

* Editor, Congressional Intelligence

ployer-contributed reserves (Wisconsin Plan).

Wide Public Support for Social Legislation

THE wide enthusiasm for social legislation is astounding. The movement has received more impetus in the past 12 months than it was given in the more than half century preceding, during which numerous plans were worked out, proposed, laboriously tried, amended, and became operative, both here and abroad. The movement, however, is much farther advanced in Europe than in the United States, and unemployment insurance plans, old age benefits, health and accident insurance programs, combined or singly, are in operation in more than two score foreign countries.

Social legislation, as it faces the incoming Congress, falls largely into three distinct classes: unemployment insurance, old age benefits, shorter work week proposals. This last, while seldom classed in the pure social legislation field, promises to be among the most bitterly contested of the various plans which will be introduced.

The plans and ideas submitted in the form of bills to the last Congress in these three fields, the proposals formulated by students and crackpots, the recommendations submitted by the President's Committee on Economic Security as a basis for probable legislation, all command some attention. From this welter of proposals will undoubtedly emerge the public laws which will mark a new step in national economics. Many feel the step

is so far reaching and important that it ushers in the beginning of a new epoch in American affairs.

As is usually the case when a new thought invades the minds of a people, scarcely anyone knows a great deal about the various plans, how they operate, or how they would affect the great majority of the population.

The mass of misinformation is amazing. Indicative of this are the several million recruits to a plan which has as its central premise the payment of \$200 a month to each person in the nation of 65 years of age or over, predicated on the principle that the entire amount must be expended in a month; the belief that unemployment insurance means that a worker will receive the full amount he ordinarily receives in wages when employed; the idea that health insurance entitles him to complete hospitalization when ill while the family receives the employee's regular earnings uninterruptedly.

The offices of Senators and Congressmen are already deluged with mail from earnest constituents, urging approval of visionary plans. The National legislators in Washington stalk the corridors frankly concerned over what shall be done. And a great, great many of those, either returned or sent to Washington for the first time, were elected on promises to vote for unemployment insurance, 30-hour week bills, and old age benefits.

Congressional Poll Shows Majority for Social Legislation

SEVENTY-SEVEN per cent of the House of the 74th Congress has pledged itself in replies to American Federation of Labor questionnaires as

favoring the enactment of unemployment insurance.

More than half of the 83 hold-over Senators and 10 of the 13 newly elected members to the upper chamber favor unemployment insurance.

Even more startling is the picture on 30-hour week legislation.

The same A. F. of L. poll discloses that 61.2 per cent of the new House will vote for the 30-hour week legislation. More important is the fact that the Black 30-hour week bill passed the Senate by a comfortable majority in the last Congress and now gains additional recruits from more than half of the incoming Senators.

The fire has simmered long under social legislation. The gains, however, in the United States have been slow. A decided surge given the movement preceding the war and then again shortly afterward lost ground in the "prosperity era."

But the unemployment ratio during the past four years, the tremendous growth of the number of persons requiring relief and the cost of this program have focused the sharp attention of both labor and industry on methods of handling the problem. Today the fire has the pot of social legislation boiling so briskly that plans and proposals run over the sides.

Unemployment Insurance

LARGELY because unemployment insurance will form the spearhead of the Administration attack on the problem of social insecurity, it has received the greatest attention, both from sources within and outside the Administration.

Shortly after Dec. 15, the report and recommendations of the President's Committee on Economic Security went to the Chief Executive. Composed of nearly every Cabinet chief, heads of the relief and public works agencies, and Chief Coordinator Donald Richberg, this group, headed by Secretary of Labor Perkins, compiled a library of information about the entire subject of economic security in a few short months. Expertly staffed under the direction of Dr. Edwin Witte of Wisconsin, the Committee's report covers the entire field of social insurance. Data on health and invalidity insurance, on widow and orphan benefits, on workmen's compensation legislation, on the



relief problem and its alleviation, on old age benefits, and on unemployment insurance are ably presented.

This fact, however, should not be taken to mean that the Administration plans on the enactment of this plethora of social insurance at one stroke during the coming session.

Indeed, interpretation of recent Presidential remarks and statements by so-called Administration spokesmen would indicate that passage of an unemployment insurance bill and a start in making State old age pension laws more effective through enactment of a National bill in this field would more than satisfy even the most rabid Administration economic-security planners.

By the same token there should be no light dismissal of the remainder of the program. There is every indication that, as the Administration lays its so-called long-range plans, the rest of the social insurance plans will come in for attention, if not a year hence, then two years later.

While the Administration has only recently indicated clearly enough to industry that unemployment is its problem, it does not propose to leave the matter there.

In effect, it has stated that while it is desirable that relief costs be decreased in order that budget balancing be accomplished and the tremendous flow of Government expenditures be slowed, it does not propose to allow anyone to starve.

Taking for granted the fact that unemployment is a social problem—and admittedly the one which causes the greatest total amount of distress—one turns naturally to the remedies which have been proposed to alleviate the ill.

A chronological survey of what the present Administration has done thus far in this field is interesting.

Chronology of New Deal Unemployment Insurance Movement¹

November, 1932: Governor Roosevelt elected President on national platform pledging, "unemployment insurance under state laws."

March 20, 1933: Senator Wagner introduced Federal bill to encourage state unemployment insurance legislation by allowing employers to deduct from income tax a percentage of their contributions to unemployment reserves.

September, 1933: Secretary Perkins in a published article stated that if Senator Wagner's District of Columbia unemployed reserves bill (American Plan) was enacted, she would "welcome the task of setting up the organization for its administration."

¹ Compiled by the Committee on Economic Security.

October, 1933: Secretary Perkins held a conference at Washington with Sir William Beveridge and Sir Arthur Steele-Maitland as principal speakers, to discuss aspects of unemployment insurance legislation.

February 5, 1934: Senator Wagner and Rep. Lewis introduced the Wagner-Lewis bill, drafted with close cooperation of Secretary Perkins, levying a tax of 5 per cent on the payrolls of industry against which a credit would be allowed for contributions made to unemployment insurance or reserve funds established pursuant to State law.

February 15, 1934: Conference on labor legislation called by Secretary Perkins and attended by representatives of 44 State governors, unanimously urged enactment of Wagner-Lewis bill.

March 23, 1934: President Roosevelt, in a letter on the Wagner-Lewis bill sent to Chairman Doughton of the House Ways and Means Committee, said: "I hope that the bill will be passed by the Congress at this session."

April 25, 1934: Following the letter from the President and an appeal by Rep. Lewis of the Labor Committee urging prompt enactment, the subcommittee of the Ways and Means Committee considering the Wagner-Lewis bill reported the measure to the full committee without recommendation.

June 8, 1934: President Roosevelt in his message to Congress declared: "Next winter we may well undertake the great task of furthering the security of the citizen and his family through social insurance." He stated that unemployment insurance would be included with national handling of funds but with State administration.

June 29, 1934: The Committee on Economic Security was created by the President in an executive order in which he charged the Committee with the task of studying "problems relating to the economic insecurity of individuals" and to report to him "its recommendations concerning proposals which in its judgment will promote greater economic security."

November 10, 1934: President Roosevelt appointed an Advisory Council, composed of representatives of industry, labor, and the public, to advise the Committee on Economic Security in formulating its recommendations for social insurance.

November 14, 1934: Effective methods of solving the problem of economic security were discussed at a National Conference on Economic Security called by the Committee on Economic Security. In a White House address to the delegates to the conference, President Roosevelt again declares that legislation on unemployment insurance would be before the coming Congress. He stated definitely that unemployment insurance would have to be developed along a cooperative federal-state plan and urged the delegates to press for enactment of state legislation.

Employment exchanges afford a helpful means of attacking the problem through an interchange of knowledge of where employment is afforded and unemployment exists. As part of a coordinated plan of solving the employment problem, a national system of employment exchanges is looked



upon favorably as a necessary adjunct of stabilizing employment.

Subsistence homesteads are already part of the long-range plans of the Administration to make self sufficient great number of part time employees in large industrial centers where seasonal industries are in the majority. This program, along with that of public works, forms another of the important foundation stones in the Administration attack on the problem.

Unemployment reserves and compulsory unemployment insurance then remain as the plans which attack the problem at its roots. It is in this field that the work is now being done by the Committee on Economic Security and from whose report and recommendations the President will make his suggestion for legislation to the incoming Congress.

The "American" Plan

THE unemployment reserve plan, the so-called American plan, is distinctly a product of the United States. It differs from the often vigorously denounced British unemployment insurance system (the oldest in existence) in that it requires "contributions only from employers and

stresses management's responsibility for making work steadier."¹

This plan is in effect in one state in the United States, Wisconsin. But because Wisconsin is the only State which has operative an unemployment insurance law, the plan has received the widest attention by students of the problem. And since the Wisconsin plan has served as a model for proposals in other States, having been presented in many State legislatures, its important features are worthy of inspection.

The plan covers all employees who have worked for the employer in the preceding six months and applies to all employers with ten or more employees. Farm laborers, domestic servants, governmental workers, public officials, teachers, logging and railroad workers, and part time employees are exempt.

Only the employers make the contributions and each employee's account is to be maintained separately; although two or more employers in the same industry or locality may merge their accounts with a view to regularizing their employment by co-operative activity.

The plan became compulsory last July 1. It originally provided that employers of 175,000 workers must establish approved voluntary schemes by June 1, 1934. Employers' contributions during the first two years, and whenever thereafter the individual account amounts to less than \$55 reserve per worker, is 2 per cent per year of the payroll. After the initial two years and whenever the individual worker reserve is over \$55—and less than \$75—the contribution becomes 1 per cent of the payroll. Whenever the individual reserve is \$75—or more no contribution is required.

Exemption by Employment Guarantee

EMPLOYERS may guarantee employees in advance a minimum of 42 weeks of employment a year, based on a 36 hour week, and become exempt from the unemployment reserve plan. An employer or group of employers may also become exempt if he or they establish a plan whose benefits are equal to or greater than that of the State system. But such plans cannot be contracted for through a private insurance company.

(1) "Wisconsin Unemployment Insurance Act," Paul A. Raushenbush.

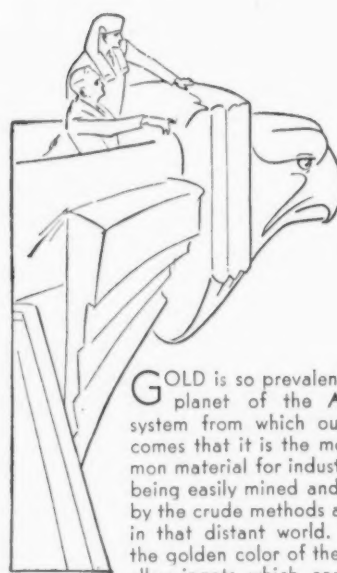
A claimant for benefits must notify the public employment office in his district of his unemployment. He must wait two weeks before benefits begin. Whenever a part-time employee's week's wage is less than the amount of the weekly benefit (\$10 a week or 50 per cent of the average weekly wage, whichever is lower) he is considered partially employed and is entitled to the difference in benefits. The minimum benefit paid is \$5 a week and each employer's account is liable for benefit in the ratio of one week of benefit to each four weeks of employment within the 52 weeks preceding the date on which the employee last worked for him. Thus more than one employer may be responsible for benefits to an employee who has changed places of employment during the year. Benefits, however, are limited to the current resources of the employer's account, viz., as the reserve account drops for each individual worker, the benefit drops proportionately \$1 a week for each \$5 drop in the reserve total per employee.

A plan based on similar employment assurance principles is the Deane unemployment reserves system which proposes a payment of double time for overtime by employers, half of the double time going into a reserve insurance fund. Its premises is that it will stabilize and regularize employment by placing a penalty on employers, forcing the hiring of additional employees at regular rates. It is likewise solely an employer contributed system.

The Ohio Plan

THE Ohio plan is another widely discussed system and differs from the Wisconsin in that it requires employer and employee contribution but neither State nor Federal aid. Contributions are based on a payment of 2 per cent of wage payrolls by the employers and 1 per cent by employees. Benefits, which would not be available until after three weeks of unemployment, would be 50 per cent of the average weekly wage but not to exceed \$15 a week, payable 16 weeks in any 12 months. The Ohio plan is not operative but has received as much attention as any other proposal in this country.

Ohio State figures show that, if the plan had been operative since 1923 it could have paid out \$179,000,000 in benefits in the first two years of the



GOLD is so prevalent on the planet of the Arcturian system from which our visitor comes that it is the most common material for industrial use, being easily mined and worked by the crude methods available in that distant world. Seeing the golden color of the copper alloy ingots which come from the molds fed by this tilting furnace, Arcturus naturally takes them for gold. When he learns of the many superior qualities of this metal for industrial use, Arcturus proposes to the Earthman guide to trade all of the gold on his planet for an equivalent supply of our so-called "baser" metal. "We would call copper a more precious metal than gold," says Arcturus, "for our measure of values is usefulness."

depression, would have entered 1932 with a surplus of \$11,000,000, and yet would have been of little help during the last two years. Its own estimates would indicate that State aid is a necessary adjunct to a successful insurance against the unusual hazards of unemployment.

The chief difference between the British system and the others heretofore described is that the British plan calls for governmental participation in the building up of the reserves by contributing one-third of the sum contributed by industry and the worker. It is based purely on insurance principles. However, as the depression became more acute and these funds became insufficient, the government made loans to the system. These loans it later canceled, thus assuming the deficit. The Government, in attempting to maintain security for the unemployed, extended the benefits beyond the original time limits, thus disregarding the statutory provisions of the Unemployment Insurance Act. It is for this reason that the plan has been so vigorously assailed as a "dole system."

Here in America wide attention

was given the national plan contained in the bill introduced in the 73rd Congress by Senator Robert Wagner of New York, long a champion of labor legislation. The bill, briefly, would provide for a Federal excise tax on employers in interstate commerce to build up Federal contributions to State operated unemployment insurance systems, at the same time providing for deductions from income taxes for employer contributions to unemployment insurance funds in the various States. In all, six unemployment insurance measures were introduced in the last Congress.

Difficulties in a National Plan

THE difficulties of meeting constitutional interpretation have acted against the possible enactment of an all-embracing National unemployment insurance plan.

The American Federation of Labor has recognized this fact and advocated the enactment of unemployment insurance plans in the various States. The A. F. of L. is unalterably opposed to employee-contributed insurance plans. In this field they join on common ground with a majority of industry which also favors employer contributions only. Labor favors State contributions. Industry does not on the premise that increased taxation to meet the burden would be needed.

Social insurance experts, looking largely toward the salvation of labor in times of unemployment, hold that a tri-contribution insurance plan calling for State or Federal, employer, and employee contributions is workable.

There are scores of unemployment benefit plans in operation, mostly of a private nature. These include those of numerous industrial plants and of various trade unions. The latter are based on worker contribution solely; the former on joint contributions. None, however, apparently form the background for a National plan in scope and many are now inoperative due to the continued length of the depression.

In passing it should be reiterated that organized labor only lately joined the movement for State or National unemployment insurance, and then only grudgingly. As late as 1906 and 1908 the national convention of the A. F. of L. opposed compulsory un-

employment insurance plans, although favoring voluntary plans operated by trade union groups. The Federation opposed private insurance entering this field and held that employer-sponsored plans were entering wedges destructive to trade unionism.

In 1931 a somewhat indefinite resolution on this subject was adopted by the national convention, favoring the presentation of a system by the



Executive Council which would conserve the best interests of labor.

Not until the recent convention in San Francisco last October did the fear of the probable harm to unionism perish in the face of tremendous unemployment totals, and a resolution was passed calling for enactment of a sound plan of unemployment insurance.

Industry, too, has evidenced a decided swing toward unemployment insurance. Not only have numerous plans of employment assurance been offered by leading industrialists but recent action by large industrial associations favoring unemployment insurance is indicative of the changed feeling toward the problem. Introduction of a resolution at the recent national congress of manufacturers favoring unemployment insurance is significant. Equally significant is the automobile industry's attitude toward

the President's suggestion of regularization of employment.

Old Age Pensions

OLD age pension legislation is almost wholly a matter of State operated systems in the United States. As in other social legislation this country is far behind most European countries in this field. Many of the latter have had operative old age pension plans for more than a generation.

Twenty-eight States and two territories (Alaska and Hawaii) had enacted old age pension laws up to March, 1934. A twenty-ninth, Arkansas, had its law declared unconstitutional almost immediately after enactment. Of the 30 laws on the statute books, 23 are mandatory and two others become so in 1935. The trend has been increasingly toward compulsory legislation since the first optional law was passed by Montana in 1923. The shift toward mandatory legislation is felt due to the experience of most States showing failure of operation unless mandatory payments by counties are required.

In 15 jurisdictions, the applicant must have reached 65 years of age; in 14 states, 70 years of age; and in one (North Dakota), 68. Wisconsin recently voted to reduce the age limit from 70 to 60. Nine laws provide for State aid to counties; seven for the State to bear the whole cost; 14 provide for the full cost to be borne by the county. The required period of residence varies from five years in Delaware to 35 in Arizona. Seventeen States demand 15 years' residence; eight require 10 years; Massachusetts and North Dakota provide for 20 years; and Alaska says a pensioner must have resided there since 1905.

In Iowa, Maine, Michigan, New York, Ohio, and Pennsylvania, county boards under State supervision guide the pension system; in Alaska and Delaware a State agency supervises; and in most of the remaining States the system is run by county authorities, either social boards created for the purpose or by the county commissioners.

Old Age Pensions Aggregated Nearly \$26,000,000 in 1933

AT the end of 1933, with pension systems operative in 28 States and Territories, funds distributed that year under compulsory or volun-

tary systems were \$25,950,248 to a total of 115,547 persons. However, only 351 counties in these jurisdictions have the pension system operative which is just 45 per cent of the total of counties in States having statutes. Cost of the pension system varies in the States with compulsory laws from 19c. per capita population in Colorado to \$1.61 in Alaska. Massachusetts recorded the highest per capita cost among the States with \$1.27.

Payments to pensioners under the various State systems operative are for the most part based on the \$1 a day maximum. More than half of the State laws provide for either \$1 a day, or from \$25 to \$30 a month. Alaska, however, allows \$35 a month (the highest and North Dakota \$150 a year (the lowest). Indiana sets the limit at \$180 a year and Kentucky at \$250 a year.

New York and Massachusetts are unique in that no limit is set on the pension payment, the amount depending on the need of the individual as determined by investigators and the supervisory board.

It is interesting to note in this connection that New York and Massachusetts record among the highest per capita cost for the total population for the operation of the pension system, while their percentage of pensioners to the total of the population is likewise in the upper brackets among States with systems. Pensioners make up 0.44 per cent of total population in Massachusetts and 0.41 per cent in

New York, only Colorado, Delaware, and Montana recording a higher percentage of persons receiving pensions.

New York, whose law was enacted in 1930, has what has been generally regarded as a most effective system. The law, enacted under the Administration of the then-Governor Roosevelt, covers the entire 62 counties in the State. At the end of 1933 the State was paying benefits to 51,106 pensioners at an average per capita cost of \$1.08 for the population with a total cost of \$13,592,080 in 1933. Thus New York paid out in pensions more than half of the total old age pension distributed throughout the United States last year.

Pension Bills in Last Congress

TWO old age pension bills were introduced before the last Congress. The Railway Retirement Act (since held unconstitutional) provided for a retirement plan for superannuated employees of all interstate carriers. Its operations, because of restrictions to one class of employees and because based definitely on past employment, are of little value in the plans for speedy national old age pension legislation.

The other bill, national in scope and designed to relieve all indigent persons 65 years of age or over, was that introduced March 14, 1934, by Rep. William P. Connery, Jr., of Massachusetts, chairman of the House Labor Committee. The bill (H.R. 8641) was favorably reported by the Committee but did not reach voting

stage. Briefly, it would establish a National Old Age Security Bureau; provide an annual appropriation of \$10,000,000 to be divided proportionately among the States and Territories on the basis of the Federal Government meeting one-third of the total cost of the old age pensions to be distributed. It called for the ratification by State legislatures of a compulsory pension system, setting up of State Old Age Security Bureaus; provided for payment of a maximum of \$1 a day to all persons 65 or older.

Based on the annual cost of the New York and other State systems, it would appear that the \$10,000,000 appropriation would fall far short of what would be needed.

Thirty-nine foreign countries have one or more systems of old age pensions or old age insurance. These fall into three main types: voluntary insurance which is roughly a system under which the Government sells annuities cheaper than private companies; compulsory insurance under which contributions are made to a fund by two or all of the parties concerned, namely the State, employer, and employee; and public pensions under which the cost of the system is borne wholly by the public, and pensions are paid to citizens reaching a certain age, without other means of support and without regard as to whether they have been employed workers.

The voluntary system has been introduced in six countries (France, Canada, Switzerland, Japan, Netherlands, Italy) and has not succeeded in obtaining large coverage, according to statistics available. The compulsory insurance principle has so far the greatest acceptance and in general is favored by the British Dominions and the Scandinavian countries. It is in force in the chief industrial countries of Europe, including Germany, France, Great Britain, and Italy. France and Great Britain also have a pension system.

Contributions in the compulsory systems are made either as a certain percentage of wages or salaries or as a definite sum of money to be contributed weekly or monthly. Public contribution to funds are either proportional to the contributions of the insured and their employers or in the form of grants representing a definite sum per insured. Some countries



have resorted to special taxation for this purpose.

Public old age insurance, which in the main is the principle of practically all of the American State systems, is intended for and applies to the economically lowest groups of the population, principally wage earners and low-salaried employees. A number of countries which have this system have established a secondary higher income limit for voluntary insurance, applying to persons whose incomes are above the limit for compulsory insurance and below the secondary higher limit. Such a plan covers, under the compulsory and voluntary plans, the great majority of the medium and low paid workers of a nation.

In general in the United States there seems to be wide acceptance of the compulsory public old age system under which the taxpayer bears the total cost of caring for the indigent aged.

Prospects of 30-Hour Week Legislation

WHILE agitation for shorter working hours can be traced to the very earliest times, the movement for the 30-hour week is of comparatively recent origin. Organized movements in the United States for shorter hours received their greatest impetus following the 1884 meeting of the American Federation of Labor when delegates voted for a general strike unless the eight-hour day was generally accepted by industry by May 1, 1886. Violent labor unrest followed, culminating in the bloody Haymarket riots. The nine-hour day was generally adopted in most industries for many years following this outburst of labor troubles.

But so difficult of achievement and so vigorously fought was this program of hour reduction that only a few years ago the American Federation of Labor shooed away from further shorter hour agitation as being unwise at the time, advising that consolidation of the gains made on the eight-hour day and 44-hour week be the object.

In 1889 the A. F. of L. came out for an eight-hour day; in 1926 for the five-day, 40-hour week; in 1933 at the Washington convention approved the 35-hour week; and in 1934 at the October San Francisco convention adopted a resolution calling for



national imposition of the 30-hour week.

The Connery and Black Bills

FROM a national legislative standpoint, the movement for the 30-hour week is quite new, receiving its first public recognition in the introduction of several bills in the last (73rd) Congress. These included the so-called Black-Connery bill (S. 158 & H.R. 4557) and the Connery bill (H.R. 8492).

The former was introduced in the first session and the Senate bill was passed by the Senate 53-30 on April 6, 1933.

The House bill, recommended for passage by the House Labor Committee, was on its way for passage but action on it was abandoned when the National Industrial Recovery Act was passed. Proponents of the 30-hour week measure had been assured that the NRA would accomplish the purpose sought.

In the second session a movement again got under way to pass the 30-hour bill and a House bill (H.R. 8492), which was basically the same as the Senate and House bills of the first session, was introduced by Rep. Connery of the Labor Committee and recommended for passage on March 7, 1934. The bill slipped into a leg-

islative jam of the Rules Committee and was not recommended for floor action.

In the closing days of the session a determined effort to secure a vote was made. A petition was circulated among the House members and gained some 90 signatures, seeking suspension of rules in order that a vote might be taken. Administration antagonism to the legislation at that time held back more vigorous support.

The Black bill, as passed by the Senate, would prohibit interstate commerce of any article or commodity except milk and its products, which was produced in any establishment where any workers except the officers or executives worked more than five days a week or six hours a day. Numerous exceptions were made, such as canneries, or others handling perishable foods, newspapers, or agricultural or farm products, processed for first sale by the original producer.

The Bill was intended to be effective for two years from date of enactment to operate in the present emergency. As amended by the House it would have set up a national Federal Regulation Board which would act as a licensing agency to permit interstate commerce to employers having in force the 30-hour week. The same exceptions were noted as in the Senate bill.

Doubtful Constitutionality of Black Bill

BOTH Senate and House sponsors of the legislation realized the doubtful constitutionality of the measure and precautions were taken to point out that not only was it an emergency measure of limited tenure but that it affected the nation vitally even more than the Child Labor Amendment.

Other bills having to do with the 30-hour movement introduced in the last session included a measure seeking an investigation into social and economic ills of the nation so that remedies could be devised (H.R. 7138 by Connery); and an interstate commerce prohibition of more than 30 hours a week employment (H.R. 4116 by Dunn, Pa.).

Lengthy Congressional hearings on the 30-hour week proposal have been held by both House and Senate Committees, and the testimony elicited there from social workers, Administration figures, and industrial and

labor leaders forms the only and probably most important data available on this subject. Apart from statistics on the operation of isolated industries under shorter hours (none of which are yet as low as 30 per week) these opinions given at the hearings form the bulk of material at hand.

The movement received a decided impetus in the last few months due to the publicity given the Congressional proposals, the widely publicized endorsement by the American Federation of Labor of the 30-hour week, and the promises made by Congressional candidates in every state in the nation that they subscribed to a program of shorter hours.

The expected acceptance by the cotton garment industry of President Roosevelt's executive order decreeing a 36-hour week with no cut in pay for that industry also lent weight to the movement for shorter hours.

Summary

A summary of the general situation in the matter of social legislation scheduled for the 74th Congress is as follows:

1. That Administration sponsored unemployment insurance legislation will be introduced, almost certainly enacted. While the exact nature of this legislation awaits the President's message on the subject, a system of State operated plans, under National supervision providing for Federal contributions for a limited period at least, is considered probable. There is every likelihood that the State systems would be made compulsory. The best features of unemployment insurance (American plan) with that of the British compulsory system may form the basis for the State systems to be endorsed. Federal contribution to the program is considered a certainty. Because the relief problem is tied in so intimately with the unemployment insurance program, it is probable that the Federal Government will continue to provide for the vast number not now employed until industry gradually absorbs its normal quota of workers, these coming under the various systems as they become employed. Labor will be protected in that its insistence that there be no restriction on the mobility of workers, that a worker on strike cannot be discriminated against and that no "registration" records be used by employers as a

"police check" of employees. Further taxation to insure revenue for Federal contribution will be avoided if possible. The present outlook, however, is that, apart from the need for funds, some form of enforcing clause will be required and a taxation angle is the most likely. Further compliance is likely to be sought by the "bonus" plan of allowing income tax deductions for amounts contributed to the unemployment insurance fund.

2. That old age pension legislation, either as a part of the unemployment insurance system, but more likely as a separate bill acting as a corollary for economic security, will also be introduced under Administration aegis. While enactment is just as certain as unemployment insurance if the Administration is favorable—and at this writing in spite of ambiguities and misinterpretation of Presidential statements it most certainly is—the additional burden on Government funds may make many legislators wary.

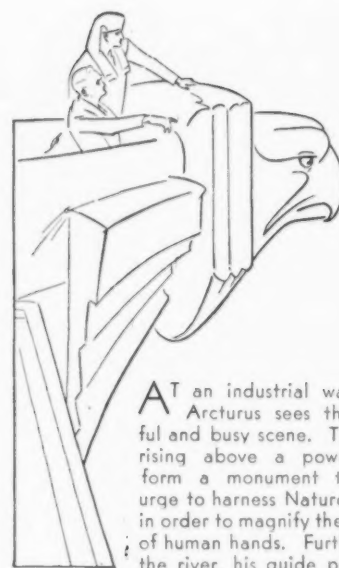
Proposed Plan

The bill, as it now shapes up, would provide for separate State operated compulsory systems with definite quota contributions by the Federal Government with a model State bill, probably the New York State bill, given as the preferred form of State enactment.

There is no disposition to disregard the present public old age insurance plan, i.e., requiring no contribution by either the employee or employer during employment to build up a reserve for old age.

3. That numerous 30-hour week bills will be introduced with the entire subject affording more hours of debate, probably, than any other legislation. As this is written there is no indication of Administration sponsorship for this type of legislation and there is little likelihood of its enactment if this sponsorship is lacking. This, despite the unqualified strength already noted for this legislation in both the Senate and House.

Either an administration message calling attention to the eventual need for a shorter working week and the desirability of steps being taken to bring this about within the next few years or the passage of a resolution creating a Commission to study the problem is thought to be the eventual



AT an industrial waterfront, Arcturus sees this colorful and busy scene. Tall stacks rising above a power plant form a monument to man's urge to harness Nature's forces in order to magnify the potency of human hands. Further down the river, his guide points out to Arcturus the seemingly endless vista of mills and factories. The strange visitor is especially absorbed by the rise and fall of the grab buckets dipping deep into the bowels of coal, sand and ore barges to take their multi-ton bites and then carry them high to the aeries of power and production.

solution for 30-hour week proposals by this Congress.

4. That health insurance and similar other social legislative measures, all to be mentioned in the report of the Committee on Economic Security, will not be handled legislatively at the coming session. A message calling attention to the preliminary studies made in this field and the need for further data, the necessity for further economic recovery, the advisability of not making changes too rapidly, would clarify the picture in this field and lend emphasis for a program a year or two hence. The fact that there is little Congressional pressure in this field makes it almost certain that a bill in this field will not command attention.

5. That there is a good chance for the enactment of a resolution which will empower the President to create a permanent Commission, based on the setup of the Committee on Economic Security, charged with the duty of making surveys and compiling data on the entire social question. Such an arrangement would permit the President's personal observance of programs, plans and long range preparations for a degree of economic security.

INCREASED acceleration was not only a feature of 1934 motor cars; it characterized the pace of the industry as well. Car assemblies in the United States and Canada for the past year are estimated at 2,825,000 units as against 1,985,909 in 1933.

In addition to this remarkable sales performance, the industry has stood as a shining example of what private enterprise can accomplish in a recovery drive when that enterprise is dynamic and is faced with a minimum of Government interference.

Automobile Industry's Recovery Was a Feature of 1934

NINETEEN thirty-four was a year of notable recovery in the automobile industry. It was a year of increasing production of both passenger cars and trucks, of expanding plant capacity, of mounting expenditures for modernization of equipment and of transition of operating and sales organizations from an emergency depression basis to a more lasting and stable form to handle further improvement in business the coming year.

It was a year during which the Big Three—General Motors, Ford and Chrysler—strengthened their strangle-hold on the industry and small independent manufacturers found the going much rougher. It was a year in which farmers, the largest group of automobile buyers in

By **BURNHAM FINNEY**
Detroit Editor, The Iron Age

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the country, reentered the market after several years' absence. It was a year during which great progress was made in restoring demand for American cars abroad.

Not far from the top rung of achievements in the last 12 months was the way in which the industry met the challenge of both Government and the public to show what private enterprise could accomplish in the recovery drive with a minimum of outside interference. Capital expenditures were made in relatively large

volume to produce more attractive and salable cars. Even with costs rising sharply and profit margins narrowing, the public was offered probably more value for its money than in any other product.

In the realm of industrial relations the automotive industry stood during the year as a bulwark against the extraordinary efforts of labor union organizers to regiment the workers of a traditionally open shop industry. It retained against powerful opposition the merit clause in its code, guaranteeing the right to employ and discharge men on the basis of their merits rather than their affiliation or non-affiliation with any employee association or union. For its benefit President Roosevelt settled the threatened general strike last March with

the understanding that in collective bargaining proportional representation shall prevail and minorities as well as the majority shall have the right to voice their opinions.

Ford's Amazing Comeback

FORD'S amazing comeback from a poor second to a neck-and-neck finish with Chevrolet for premier honors in the number of cars built and sold was one of the events of the year. In the passenger car field Ford accounted for 29 per cent of the industry's total, compared with 20 per cent in 1933 (1934 figures are based on complete records for nine months). Most of the gain was made at the expense of Chevrolet, which dropped from 32.7 per cent of the total in 1933 to 27.7 per cent the past year. Plymouth, with 16 per cent of all registrations, held its own.

General Motors, entirely due to Chevrolet's slippage, sold 39 per cent of all cars in the United States, as against 44 per cent in the previous year. Chrysler slumped from 25 per cent of the industry's sales in 1933 to 22.9 per cent in 1934, despite slight improvements in the positions of Plymouth and Dodge. The decrease can be chalked up to declines in registrations of DeSoto and Chrysler cars.

General Motors, Ford and Chrysler together sold 91 per cent of the total the past year, whereas in 1933 their proportion was 90 per cent. While this wasn't much of an increase, it meant taking away from independent manufacturers another slice of the small business which is still theirs.

To narrow comparisons still further, the three leading low-price cars—Chevrolet, Ford and Plymouth—corralled 72.9 per cent of the retail sales made by the industry the past year, as against 68.8 per cent in the preceding 12 months. Judged on the basis of estimated dollar volume, cars selling for less than \$1,000 did \$983,400,000 worth of business out of the industry's total of \$1,093,900,000 in the period from January to October inclusive. This surely is conclusive evidence why almost every car manufacturer is rushing into the market in 1934 with a lower-price automobile to add to its present line. Incidentally, it is significant of the general trend that in a recovery year the only group of cars which failed to show a gain over 1933 was in the quality car field.

Improvement Stimulates Sales

ALTHOUGH the depression has given impetus to the movement which has bunched most cars in the less-than-\$1,000 market, it is not that alone which is responsible for the present situation. H. J. Klingler, president Pontiac Motor Co., put his finger on a basic factor when he said recently that "manufacturers of low-price cars have improved their products more in the last three years than during all of their previous history." The car selling today for \$750 to \$800 is a better vehicle than the \$1,500 car of a few years ago. Is there a place for a \$1,000-\$2,000 car today? Just what that market offers will be revealed the coming year when two makers, heretofore exclusively in the high-price field, present cars probably priced around

\$1,200. The car with a factory price tag of \$1,500 to \$2,000 apparently has such slim prospects that few are willing to take a chance on it. The volume is so small that production costs are abnormally high.

Changes in merchandising policies on the part of leading automobile companies are bringing some radical departures from the traditional methods of doing business. The retail dealer with an elaborate establishment in so-called "automobile row" is rapidly disappearing. Cars aren't sold on the floors of stodgy, stuffed-shirt-front show rooms, but during demonstration on the road and at the curb in front of the customer's home. As a result of this discovery, which was apparent to everyone outside the automobile industry before the industry itself became conscious of it, dealers are erecting stations to give all types of service to car owners in the neighborhood. Two or three cars are displayed in a small room adjoining the station. The service work keeps the dealer in contact with new car prospects and at the same time pays his overhead expenses.

This new type of neighborhood service station has been promoted most aggressively by Ford, which is encouraging dealers to open "feeder" service stations to help get business for their main establishment. Chevrolet also is urging its dealers to adopt the neighborhood service plan wherever practicable, although it does not recommend "feeder" stations. Other manufacturers are in the initial stages of programs designed to induce their dealers to take hold of the neighborhood service idea. Detroit has been the center of the most intensive development of neighborhood service stations. However, these stations are springing up daily in almost all parts of the country and appear destined sooner or later to supersede the time-venerated type.

Reorganization in General Motors

WHEN the depression was at its worst and curtailments were in order, General Motors formed the B-O-P organization, making a combination of Buick-Olds-Pontiac for economical manufacturing and selling purposes. Late in 1933 local executive autonomy was restored to the



THE Automobile Labor Board has done a notable job of keeping peace in the industry. Without fanfare of publicity, Dr. Leo Wolman (right) as chairman has pursued a conciliatory policy fair to both sides, but distasteful to the militant A. F. of L. which thrives on trouble-breeding. Nicholas Kelly, representing manufacturers, is at the left and Richard Byrd, representing labor, is in the center.

WHY the steel industry's eyes are turned toward Detroit. A bank of steel frames ready for the assembly line in a Chevrolet plant.



various divisions, particularly from a manufacturing standpoint. Just a month or two ago, sales independence was achieved when Buick and Pontiac set up their individual field sales staffs and were granted a bill of divorcement by the General Motors management.

At the same time Chrysler Corp. effected a reorganization of its field selling force so that Plymouth became the spearhead in its merchandising attack, enabling this division to get better coverage in the small population centers where Ford and Chevrolet have much of their strength.

Ford "went modern" in a big way in 1934. It used various forms of advertising, including radio, extensively. The Ford exhibit made an indelible impression on visitors to the Century of Progress. The many merchandising avenues long attractive to others, but heretofore scorned by Mr. Ford, were explored with enviable success. This about-face by the Sage of Dearborn is believed to have aided tremendously in putting the Ford company back into the sales limelight.

Rapprochement between factories and dealers was aided by support given by manufacturers late in the year to the retail automobile code. Factories have been accused for years on end of being autocratic and ruthless in their treatment of dealers, but enlightened management of the car-producing companies is doing much to bring about a new relationship. Manufacturers realize that they can't

sell cars without dealers and that they often can secure valuable advice as well as give it in their dealer relationship. That the industry has become "dealer conscious" is shown by the recent action of General Motors in creating four dealer councils throughout the country. Each council is comprised of 12 dealers representative of all car divisions who will serve for six months and then be replaced by others. These dealers will meet with a group from the executive committee of the corporation, which determines all basic operating policies. At these meetings "there will be presented a moving picture, so to speak, of dealer thought with relation to dealer problems, both present and future."

Chrysler Streamlining

WITH regard to car design and mechanical innovations, the year 1934 stirred violent controversy. The Airflow car of Chrysler and DeSoto was introduced. Walter P. Chrysler decided to gamble on this new principle in car construction and body design. If results are to be judged on car sales, the move can be put down as an error of judgment. On the other hand, if satisfaction comes from pioneering new paths along which others follow, Mr. Chrysler has no cause to regret his decision. Car design for 1935 is in the direction of the Airflow principle. The principle of weight redistribution, calling for relocation of the rear seat ahead of the rear axle, is

being copied by other manufacturers and bids fair eventually to be adopted by the entire industry.

No less a subject of discussion than the Airflow cars were knee action front wheels. Independent springing was first adopted by General Motors and Chrysler and later introduced by other companies. Nothing in recent years in the motor car world has caused more debate pro and con. Elimination of knee action from 1935 Plymouth and Dodge cars has intensified interest in its merits and its drawbacks. Studebaker for the coming year has adopted independent springing of its own design. Other independent makers are planning to take up with it for the first time. General Motors apparently stands committed to it permanently, so far as one can see ahead. Chief argument in favor of knee action seems to be that it gives the same sort of ride to a car as though it had a much longer wheelbase and much heavier weight than it actually has. On the other hand, a certain group of observers are of the opinion that knee action was instituted hastily when a major selling feature was badly needed, that it is highly overrated, that its cost doesn't justify its use and that within a year or two it is likely to go out as free wheeling did.

Although Ford has never adopted knee action, it owes a debt of gratitude to it. It was the difficulty which Chevrolet experienced in the first two or three months of 1934 in getting

production of knee action units that enabled Ford to establish a commanding lead in registrations.

Rear Mounted Engines

CAR design is moving in the direction of a transfer of the engine from the front to the rear. How far off this is for the average automobile is a matter of opinion, but at the minimum it probably is three to five years. The large volume manufacturers, with tens of millions of dollars at stake, can't afford to risk too revolutionary a departure in design at one fell swoop. The revolution has to occur in installments. Hence the opinion expressed the past summer by Mr. Chrysler that for several years low-price cars will continue to be of relatively conservative design.

However, American motorists will get a glimpse of the automobile of the future early in 1935, when the Stout Motor Car Corp., goes into limited production of a rear-engine car developed by William B. Stout, famed automotive engineer and designer of airplanes and streamline trains. This car will embody so many new principles that everything about it will be contrary to the theories adhered to in the past. Mr. Stout claims that when better automobiles are built, airplane engineers will design them. No airplane engineer, he says "would design a motor car that weighs 1500 lb. to a passenger; and when two people ride around in a 3000 lb. car, that is what it amounts to."

In the matter of materials, there has been a growing trend toward the use of electric furnace cast alloy steel and iron for various parts. Early in 1934 Ford substituted a cast crankshaft for the former forged product. Ford of Canada now is erecting an electric steel foundry to cast the crankshaft for Canadian V-eight cars. Cast camshafts are standard equipment on several makes of cars. Extensive experiments have been conducted in the casting of other automotive parts now being made out of forged steel.

Development of molybdenum steel has gone ahead at an unusual clip, particularly through the research work of C. Harold Wills and his associates in Chrysler Corp. Many alloy steels and non-ferrous metals apparently are being held back from

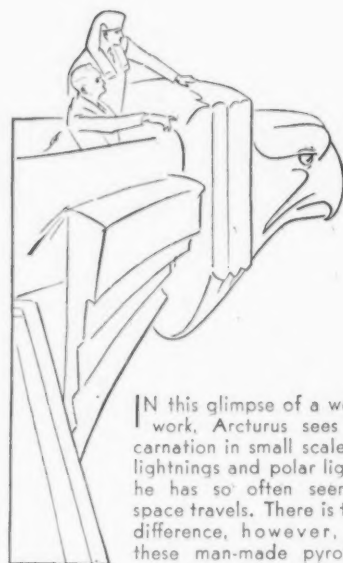
adoption solely on the basis of price. The cost of making a car is figured, in general, at so much a pound. Even though there may be marked saving of weight in some of the lighter alloys, they will not be widely employed so long as their high prices act as a preventive. On the other hand, car production executives realize that the cost of raw material often is a poor criterion of actual manufacturing expense. The only sound basis for determining the cost of a part is to take the price of the metal and add the fabricating and machining expense. Sometimes this adds up to less than the cost of utilizing a cheaper material. The stainless steel people have won acceptance of their product on this basis in connection with several automotive parts.

New Bearing Materials

BEARING materials such as copper-lead and cadmium-silver-copper are being adopted by some manufacturers. Because of great reduction in wear rather than initial cost, aluminum crankcases are being considered.

The industry is considerably nearer universal adoption of the all-steel body. Fisher Body, by far the largest builder of automobile bodies, has been the most obstinate hold-out. It has acknowledged the merits of all-steel construction by replacing the old chicken wire-and-fabric top with an all-steel roof for the 1935 Chevrolets, Pontiacs and Oldsmobiles. Later the coming year the steel roof will be extended to Buick, La Salle and Cadillac. It is considered only a matter of time until General Motors cars have all-steel bodies instead of the present composite wood-and-steel bodies. In fact, it would not be surprising if this development came in connection with 1936 cars.

Stamping practice in the fabrication of bodies, fenders and other car parts is favoring the use of larger steel sheets. This has resulted in installation of larger presses and in specification of the widest sheets rolled by steel mills. Demand has arisen for extra-wide sheets and suggestion has been made to steel companies that new wide strip mills be constructed to produce such sheets. However, no steel manufacturer has yet seen fit to respond to this demand. In the absence of the kind of wide sheets which they consider desirable, some car



IN this glimpse of a welder at work, Arcturus sees the incarnation in small scale, of the lightnings and polar lights that he has so often seen in his space travels. There is this vital difference, however, in that these man-made pyrotechnics are accomplishing a known and useful purpose. "Perhaps," remarks Arcturus, "if we knew more about the secrets of the universe, we would find that the familiar celestial fireworks which we consider without purpose are actually symptoms of the welding of space matter into new stars and planets."

makers are stitch-welding two sheets together prior to the stamping operation and then splitting them after they are formed. The statement has been made that eventually the entire side of a car would be stamped out of one piece of sheet steel. There are disadvantages as well as advantages attaching to such a process and whether it is practicable is yet to be demonstrated.

Automobile Welding

THE welding art attained new distinctions in the automobile industry in 1934. The automatic hydro-matic welding machines developed in the Dodge plant and used in other Chrysler divisions show what can be done in welding to secure high production and eliminate human fallibility. The welding of the stamped steel housing for Chevrolet and Pontiac knee action units was another job which appeared almost impossible of achievement at the beginning.

Plant modernization and expansion of productive capacity were more widespread the past year than the casual observer might suppose. Although excess automotive plant space

was available, when greatly increased output became necessary the fact soon was plain that existing equipment could not do the job economically. Hence millions were spent on new machinery, conveying equipment and new processes. Ford alone made an outlay of \$2,500,000 for machinery to enlarge machining capacity at the Rouge plant. Fisher Body expended \$3,000,000 for new presses and rearrangement of plant facilities. Chevrolet added much new equipment at Toledo, Detroit and Bay City. Packard is just now installing a large amount of equipment and rehabilitating existing machinery for the manufacture of its light car. Plymouth and Dodge added tools during the year for expansion of production. The Chrysler-DeSoto plant where Airflow cars are made has been modernized and many new processes installed. Oldsmobile has doubled its capacity at its Lansing plant. Not to be overlooked is the new Chevrolet assembly plant at Baltimore, to be ready early in 1935, which will incorporate the latest improvements to make it the last word in productive efficiency. Ford has reopened branch assembly plants at St. Louis and Long Beach, Cal. Pontiac bought a considerable amount of new equipment for manufacture of its new six.

Improvement in Export Sales

IMPROVEMENT in export sales has been one of the brightest developments in the automobile industry the past year. The betterment is attributed to the depreciation of the dollar, making it possible for a purchaser abroad to get a \$1,000 car for \$600; to economic recovery in certain countries, such as the Union of South Africa; and to renewed efforts on the part of leading manufacturers to strengthen their positions in overseas markets which possess enormous potentialities for expansion of the automobile business. The policy of the Roosevelt administration in negotiating reciprocal tariff agreements has the hearty support of the motor car industry, which envisions annual sales outside the United States of one million units. Such impetus from foreign markets would be immediately reflected in increased factory operations not only in southern Michigan, but also in 45 States where parts



ALFRED P. SLOAN, JR., has enunciated on behalf of General Motors the doctrine that management cannot get along without labor any more than labor can get along without management. Both are in the same business and the success of that business is vital to all concerned.

plants are located. There is scarcely an industry whose activities are so far-reaching in their effect on other industries as automobile manufacturing.

To illustrate the great strides taken the past year in development of foreign business, General Motors has sold about 83 per cent more units in overseas markets than in 1933. While this figure includes cars from English and German sources, the heaviest part of the increase was accounted for by cars originating in the United States. General Motors is supplying over 22 per cent of the cars and trucks sold overseas today, the largest share it has ever obtained of the foreign market.

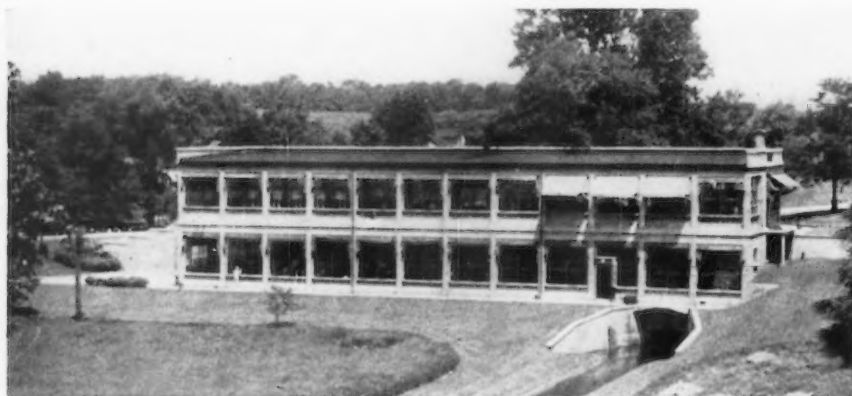
Commercial car and truck sales staged an even more impressive recovery in 1934 than passenger cars. It is estimated that domestic registrations exceeded 400,000 units, compared with 245,869 in 1933 and 180,413 in 1932. They were close in number to the 410,699 units sold in 1930. Approximately 92 per cent of the business was in trucks weighing 1½ tons or less. Sales of large trucks have been hampered by weight and length restrictions imposed by individual States. Largely because of

these limitations, heavy-duty trucks have been redesigned to shorten their over-all length by putting the motor over the front axle or under the driver's seat. The dealer situation has been aided by agreements between heavy-duty and light truck makers whereby dealers of one company will sell the other's products. This sort of arrangement is now in force between Studebaker and Autocar and between Reo and Mack.

Truck Business

CHEVROLET maintained a comfortable lead over Ford in truck registrations throughout the year, although the latter's sales in 1934 doubled those in 1933. Dodge also virtually doubled its truck business, necessitating expenditure of \$250,000 to increase manufacturing facilities at its Detroit truck plant. Because of its failure to sign the NRA compliance agreement, Ford was excluded most of the year from participation in Federal Government orders. It is almost impossible to name a specific figure which would be accurate, but one is not far wrong in saying that probably half of the truck business in the last year is traceable directly or indirectly to government programs, such as PWA.

In the industrial relations field much progress was made. Under the wise direction of Dr. Leo Wolman, the Automobile Labor Board did a commendable job of keeping the peace after the initial round of strikes which greeted the members almost immediately upon their appointment. Rules governing layoffs and reemployment of men, decisions in discrimination cases and the procedure set up for collective bargaining have established the board as a fair-minded body. General Motors took an epochal step when, about Sept. 1, it laid down rules regarding its relations with its employees and gave every worker, no matter how lowly his status, the right to carry an alleged grievance to the highest authority in his company. At the same time General Motors, without publicity, took action to level off production peaks wherever possible and thereby better stabilize employment. The industry as a whole turned its attention to ways and means of rounding off the jagged seasonal production curves so apparent over a



MR. FORD is a firm believer in decentralization of industry, with small factories scattered about the countryside and workers living nearby where they can raise part of their food. The above photograph shows one of the Ford parts plants, operated by hydroelectric power, up the Rouge River.

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period of years. This inquiry is expected to result in more stabilized operations the coming year.

Estimate of 1934 Production

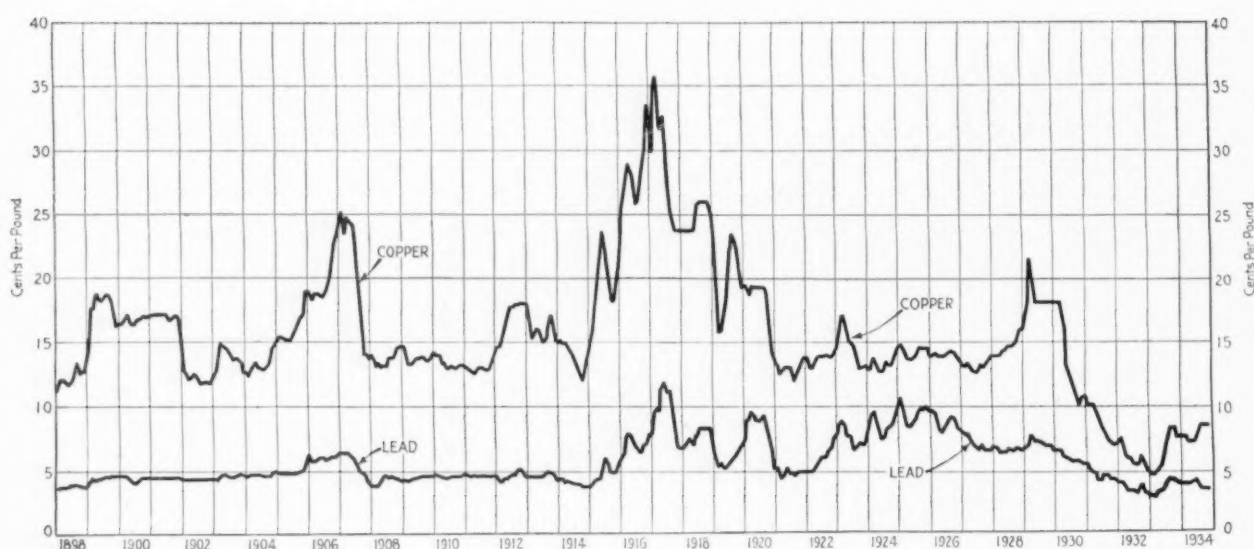
CAR assemblies in the United States and Canada during 1934 are estimated at 2,825,000 units, as against 1,985,909 units the preceding year and 1,431,494 in 1931. It was

the best year since 1930, when 3,510,178 units were turned out. Detroit now is engaged in the fascinating game of guessing what 1935 will bring. Estimates of increases over 1934 vary from 10 to 25 per cent, and in at least one case an exuberant sales manager is predicting a 40 per cent gain for the industry. At this distance it appears that the coming

year should carry motor car makers farther along the way toward recovery, and an output of 3,300,000 vehicles is not too much to expect.

A description of what the automobile industry has done in the last 12 months and what it should do in the next year would not be complete without reference to the indomitable spirit which remained with its leaders even through the darkest days of the depression and which probably is its most valuable asset today. Detroiters like to have their city called "dynamic Detroit." If one searched endlessly for a single word which best epitomizes the automobile industry, one could not find a more appropriate adjective than "dynamic." Still a youthful giant, the industry didn't take depression's blows with the resigned air of some other industries. It never surrendered, never admitted defeat. This is the reason that it has been in the vanguard of recovery's forces and that it is sweeping back with it to prosperity a score of other industries largely dependent on it for business.

Long Term Trends of Monthly Copper and Lead Prices.



Delousing the Securities Act of 1933

*Has the Securities Exchange Act of 1934 Removed the
"Bugs" Sufficiently to Make Investment
Again Practical?*

By ROBERT E. KINTNER

NO industry depends more upon flow of investment than does that of metal-working for its employment bread and butter and its profit marmelade. No industry is more closely connected with durable goods than is our industry. Hence it follows that no other field is more vitally interested in the Securities Act of 1933 and its modification through the Securities Exchange Act of 1934.

Mr. Kintner has given us, in the accompanying article, an illuminating survey of the acts and their effects.

WITH the cooperative spirit between business on the one hand and the National Administration on the other being stressed, serious study of the Securities Act of 1933 and the Securities Exchange Act of 1934 is in order. There have been few legislative measures which have aroused the acrimonious disagreement accompanied by the serious charges, as have these two laws. Both were passed in periods

of emotional stress, when impartial consideration was practically impossible.

The problems involved are in no sense academic. It will be admitted that there is a definite connection between the operations, which the laws seek to control, and the progress of economic recovery. Joseph P. Kennedy, chairman of the Securities and Exchange Commission, which has charge of administration of both laws,

has accepted this premise. He has taken as true the statement that the security business is "the most important branch of business in the country from the viewpoint of direct and indirect influence . . . upon the welfare of our population."

The indictment against the 1933 act is that it is not workable and has, as a result, retarded if not stultified the long term capital market. The exchange act of 1934 has not been in operation long enough to justify the use of the term "indictment." However, the question is raised as to whether the indirect control over corporate affairs, given to the S. E. C., is not too great an infringement of the freedom of action of corporate management.

With Congress in session, consideration of amendment of the laws is pertinent. Answers are being sought to the question of whether the rank and file of established corporations can raise new funds under the securities act without incurring other than

reasonable obligations. Executives particularly are resurveying the exchange act to determine if its requirements will be too burdensome.

The securities act of 1933 remained in operation for almost a year without amendment. Because of the changes in the law, made in the last session of Congress as a rider to the securities exchange act, the year's operation may be passed over. During the period there was a dearth of conservative issues, which would attract careful security buyers. How much of this lethargy was due to the securities act and how much to the uncertain business outlook, will never be settled.

Flotations Were Held Up

HOWEVER, even the most ardent of the defenders of the legislation will admit that the act held up flotations of issues. The view of business is perhaps best expressed by a statement in "Analysis of the Recovery Problem," made by the Durable Goods Industries Committee to the President on May 14, 1934. Under the signature of George H. Houston, chairman, the committee said, "For instance, industry is convinced that the securities act of 1933, which was intended to protect the investor by regulating the issuance and sale of securities, actually has had the effect of preventing the issuance of such securities."

The point now is determination of whether the amendments have made the law workable. There have been strenuous objections to responsibilities placed on all those connected with the issuance of securities and to the costs of complying with the law. There has been a general criticism that the act is not serving its purpose. What remnant of legitimacy remains for these arguments under the new order?

Amendments Are An Improvement

IN brief it may be stated that the amendments are a distinct improvement and have removed many of the objections. Whether they are sufficient to attract the older and more conservative company into the market to satisfy its capital needs will only be settled by the passage of time. Reputable business leaders still complain. Before considering their case let us glance briefly at the changes made.

The amendments have reduced the extent of civil liability, involved in an untrue statement or an omission to state a material fact in a registration statement. The length of the periods of liability have been reduced. However, in great part the changes corrected mechanical defects in the law. The important amendments may be analyzed as follows:

Section 11a was amended to provide that there is no liability for false statement in a registration statement, if the issuer has made generally available a 12-month earning statement from the date of the registration statement, unless it is proved that the investor relied on the registration statement. However, reliance may still be established without proof of the reading of the registration statement. Practically, this amendment means that with the issuance of yearly reports of companies, under the exchange act, the liability for statements in the securities act statement is decreased.

Section 11c was amended to interpret the standard of reasonable investigation and reasonable ground for belief as the "standard of reasonableness shall be that required of a prudent man in the management of his own property." This means that a director may sign a statement, based on such investigation as he would make in his own affairs. He may take the word of a trusted subordinate.

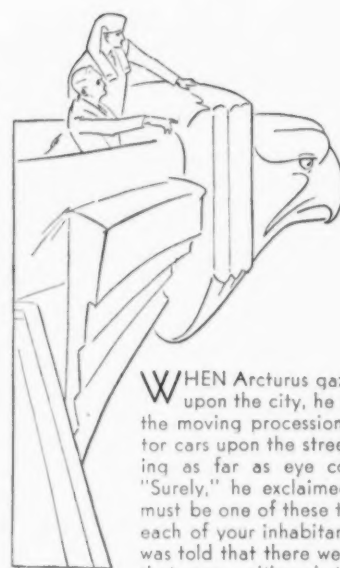
Section 11e was amended to reduce the liability of issuing houses to amounts not greater than each offered to the public. Provision was also made for assessing costs and reasonable expenses on plaintiffs in suits without merit.

Section 13 was amended to reduce the periods of liability from ten years to three and from two years to one, as the case might be.

Since enactment of the amendments, there has been no great influx of high-grade issues for the investing public. A partial reason, the casual importance of which can not be factually determined, lies in uncertain business outlook. However, as was the case before the changes, you can still talk with partners of leading investment banking firms and with officers of leading corporations to learn of actual instances of needed financing, held up because of reluctance to pay the expense involved in registration or to incur the liabilities of the law. However, a slightly brighter picture is being painted by the registration statistics, presented by the S. E. C. The term "brighter" is used advisedly as the following discussion will show.

Reversal of Trend Now Shown

THE latest monthly figures at hand on offerings effective under the law are preliminary ones for October 1934, made public by the commission last month. They show 25 registrations effective during the month to the amount of \$34,009,946.



WHEN Arcturus gazed down upon the city, he observed the moving processions of motor cars upon the streets reaching as far as eye could see. "Surely," he exclaimed, "there must be one of these things for each of your inhabitants." He was told that there were hardly that many, although there was a goodly number, in fact one for each five or six persons, sufficient, indeed, to move the entire population at one time, if that were desired. "How can you turn them out so rapidly?" he inquired. So, among other things, he was shown this huge press stamping out body parts. "It looks simple," said his guide, "but you would be surprised to know how much effort and research have been spent in just developing the sort of steel sheet which makes this operation feasible."

The "encouraging" feature is that of the total, 11 were industrial or commercial issues amounting to \$26,314,837.

This is a reversal of the general trend of the 15-month operation, which, according to preliminary S. E. C. figures, shows effective offerings to the amount of \$1,242,120,716. As the following tabulation for the 15 months ended Oct. 31, 1934, shows, the previous trend was for financials, which include mainly investment trust issues, giving little new capital to industry, to compose the great bulk of the amount of offerings.

Type of Issue	Number of Statements	Amount of Offering
Industrials	361	\$330,645,372.38
Financials	217	717,925,531.44
Reorganizations ...	271	193,549,812.72
Total	849	\$1,242,120,716.54

The trend toward an increase of industrial offerings, as was said, may be considered a bright spot. However, analysis of recent issues show that the highly speculative brewery, distilling and mining offerings, to

which investment banking circles have found so much objection, still abound. The \$20,100,000 flotation of the Edison Electric Illuminating Co. of Boston is the one issue which might be termed "important" among those effective in October.

However, between the last week in November and the first week of December, two large and well established companies registered issues under the act. The Republic Steel Corp., in connection with its plan of reorganization and consolidation with the Corrigan, McKinney Steel Co. and the Truscon Steel Co., registered four classes of securities, having a total value of \$67,877,836. This was the largest single filing made to that date under the act. The Chesapeake Corporation registered a new issue of \$18,000,000 of bonds, to be used to refund the unpaid balance of certain bank debts.

Any Hindrance Is a Challenge

THE type of issues being floated, when considered with the fact that there seems a need for financing for established companies, makes any hindrance to the flow of new capital a challenge. Although the act has been decidedly improved and although attorneys, who have previously advised clients not to issue securities, are counseling that flotations may now be made if "utmost care" is exercised, there is still definite question as to whether other changes are not needed.

The issuer, the underwriter, the director and officer and the expert each have some modification, which, it is vigorously contended, is needed if private funds are to aid in reviving and in rebuilding business. The complaints are so varied and in some cases so prejudiced, that it seems best to turn to the Securities and Exchange Commission itself for the protests, which that agency recognizes as coming from "reputable" people in the community. Mr. Kennedy has summarized these arguments and they may well be considered from his analysis, for he has given the studied replies of himself and his colleagues.

Specific charges, he has said in his first formal consideration of the operation of the law, are four fold, as follows:

First, the act imposes liability

upon directors and corporate officers with unwarranted severity.

Second, registration under the act entails excessive and burdensome expense.

Third, the act requires information, the securing of which entails disproportionate effort and much of this information is irrelevant to the investor.

Fourth, the delay caused by the act between first corporate action towards floating an issue and final clearance of the commission operates adversely to the corporation.

Citing the fact the burden of liability has been decreased through the amendment, making the standard of investigation that of a "reasonable" man, Mr. Kennedy brushed aside the first objection with the contention that a minimum requirement of directors is "that they be careful and that they be honest." In minimizing the objection, he appears to be in step with many for the vigor of the outcry against the liabilities has declined.

The reasons for this change of sentiment, in connection with which it should be said that there is still no unanimity, are several. Primarily the amendment clarifying the standards of investigation has been the cause. To this has been added recognition of the fact that liability can be reduced when the defendant proves that any part of the depreciation in value can not be ascribed to the false statement, and of the fact that the law is carrying over to a director common law liabilities which have existed in regard to others connected with issuing securities.

Change Mainly Psychological

ONE of the main reasons for the changed feeling appears to be psychological. The securities act of 1933 is strictly New Deal legislation. Perhaps it has gone to an extreme as a result of the emotional bias, attendant with revelation of abuses. Business attitude is becoming more and more one of cooperation on the expectation that time will bring an impartial review. This attitude appears reflected in the tendency of corporation officials that "perhaps they will go along."

The second objection to the law is still a hot-bed of dispute. In discussing the objections, Mr. Kennedy presented an analysis of the "costs

of registration and sale and distribution of ten large issues of securities floated in this country since July 30, 1933." The issues varied in size from \$5,000,000 to \$55,000,000 with gross proceeds aggregating \$126,200,000.

Total costs of selling and distribution, the S. E. C. chairman said, excluding commissions or discounts paid to bankers, amounted to \$923,000 or less than 1 per cent of the total gross proceeds. The financing costs, "which might be attributed wholly or in part to new legislation," he added, accounted for \$482,700.

"Furthermore," he concluded, "the total items of expense which by any stretch of the imagination can be chargeable to new legislation amounts to 38/100 of 1 per cent of the gross proceeds of the finances involved, and there can be no doubt that an appreciable part of legal and accounting expenses, which are included in the above costs would have had to be incurred even if there were no Securities and Exchange Commission and no registration."

To offset the contention that the securities act has increased tremendously legal and auditing expenses, Mr. Kennedy cited a study of ten issues floated prior to 1933, whose legal and auditing expenses amounted to 1/2 of 1 per cent of the total capital raised, as against 3/8 of 1 per cent for the ten issues floated under the securities act.

Cost of Registration

A BETTER picture of exactly what it costs to register issues under the securities act can be gained from the following tabulation, as forwarded by the S. E. C. in response to question, showing the amount and expenses of the issues used in the study.

Company	Amount	Legal Costs	Accounting Costs
Edison Electric....	\$35,000,000	\$7,500	\$20,000
Edison Electric....	20,000,000	7,500	12,000
Central States Power & Light..	6,000,000	2,500	1,500
Northern Power...	10,000,000	30,000	76,500
American Water Works	15,000,000	90,000	72,000
Mathieson Alkali Works	6,232,830	10,000	10,000
Christian Moerlein Brewery	5,750,000	5,000	None Filed
National Distillery Distillers & Brewers Corp. of America	16,850,000	50,000	45,000
Abba Gold Mining	6,325,000	15,000	12,500*
	5,000,000	1,500	1,000*

*Other fees included.

The aggregate registration fees for the ten issues, which include five bond

and five stock, amounted to \$13,500. Totalling this sum with the \$219,000 in legal fees and the \$250,200 in accounting and other costs gives \$482,700. This is 38/100 of 1 per cent of the gross proceeds of \$126,200,000.

The tabulation apparently shows that there has been some exaggeration of the costs, attendant on complying with the securities act. Still, it should be noted that in the case of the issue of American Water Works, legal and accounting expenses amounted to \$162,000, to which must be added \$3,000 registration fee, to make the cost 1 1/10 per cent of the gross proceeds. This is the largest percentage in the study.

According to figures obtained from the S. E. C., the \$18,000,000 issue of Chesapeake Corporation bonds involved an estimated expense in connection with the sale of \$149,290, of which \$60,000 was the cost of preparing the registration statements and prospectus and the legal accounting and other expenses connected with it. Making up nearly one-half of the total cost, this expense caused by compliance with the law is by far the largest item. With the \$1,890 registration fee added, the expenses amount to 34/100 of 1 per cent of the gross proceeds, a close approximation to the conclusion of the commission study.

Cost of Republic Steel Issues

IN the case of the Republic Steel Corp. issues of \$67,877,836, total expenses of the reorganization plan, as shown in the registration statement estimate amount to \$1,200,000 exclusive of shares given to two investment firms and payments to dealers for solicitation of preferred stock deposits. Because the items are not broken down, costs applicable to the act cannot be shown. Total legal expenses are estimated at \$350,000 and accounting expenses at \$125,000.

The difference in the percentage of costs applicable to the act of the various issues brings up a forceful criticism of the law. It is less expensive for newly formed enterprises to file the data demanded by registration than it is for the older companies, particularly those whose operations are far-flung. Such empires, as the American Telephone & Telegraph Co. and the United States Steel Corp., it has been said, would find it a matter of many months be-

fore either could file the information needed. In smaller degree, this would probably be true of hundreds of established companies.

In answer to this objection, which is generally considered legitimate, it is contended that the fault lies with the corporation for failing to keep accurate records, particularly in regard to the relation to subsidiaries. Whether true or not, executives of the larger corporations find the "research" problem a real one. After one issue is registered, the costs of future offerings is of course decreased. This has led to the belief that the initial "burden" should be borne, in order that future registration may be easier.

Less pessimism is held on this point principally because of the statement from Mr. Kennedy that the "S.E.C. is confident that it can remove any of the technicalities in the administration of the 1933 securities act, which is said to be burdensome to the securities business."

Regular Reports Required

THERE is another development, which should have an important effect on the compilation of data under the law. The S.E.C., under the exchange law, will require regular reports from corporations with securities listed on exchanges. It has been authoritatively indicated that the S.E.C. is working toward the correlation of the requirements of the two laws. In other words, it is hoped to establish certain accounting principles and methods of compilation, which will make the exchange law reports useful in complying with the 1933 act. There may be objection to this indirect control of the method of corporate recording but such operation would allow any "burden" to become a more gradual one.

It is well to remember that the securities act of 1933 has been in operation less than eighteen months, a short period and one which has found business bewildered by changes in the governments' relation toward its operation. Precedents and interpretations have yet to be established. This seasoning process, which will be effective as the law continues in force, offers still another factor for hope that the views of the issuers and underwriters may fall on common ground with the requirements of the act.

The third objection, as outlined by Mr. Kennedy, is that the information required calls for disproportionate effort and that much of it is irrelevant to the investor. Mr. Kennedy promised that the forms would be simpler and his words have been borne out. From Washington almost daily come modifications and interpretations, to that end. Notwithstanding this cooperation, there is an important issue—how much does the ordinary investor gain from the voluminous data of the registration statement and the page after page of prospectus?

Some time after the amendments became effective, the writer had an interview with A. A. Berle, Jr., original member of the Roosevelt "brain trust" and a recognized authority on the securities act. In response to a question, he said that information gathered in the reports, though desirable in every way, was so complex as to be useless to any but the trained investor, or financial analyst, of whom there are few.

Complexity May Be Confusing

THIS view, it is thought, is held by most students of the law. The public is getting "the truth and the whole truth" but in an improper form for service as a basis for intelligent investment by the average buyer. The information establishes a basis for liability and therefore forms the backbone of the act. Still, in view of protests on expense and on the complex forms, whether the material is useful to the investor is important. What may be described as the "ignorance" of the average investor is a primary reason for the uselessness of the material, but the law is regulating security flotations in present society and should deal with the "truth and the whole truth" on as practical a basis as possible.

The last "official" criticism is that the time between the initial move for an offering and the final clearance of the commission works adversely to the corporation. Some delay is inevitable under statutory control. Viewed from the hectic financing of the past, perhaps such delay, although inconvenient to the corporation and more particularly to the underwriter, is justified. In any event, the S.E.C. has promised that its decisions will be expedited.

There is another criticism of the
(CONTINUED ON PAGE 239)



WILLIS H. CARRIER

If the air conditioning industry can be said to have a "father," no one deserves the title more than Willis H. Carrier, chairman of the board of the Carrier Corp., Newark, N. J. His achievements were recognized recently by the engineering profession when he was awarded the A.S.M.E. Medal for 1934, for research and development work in the industry. Mr. Carrier was largely responsible for the spray-type air washer to which the business is indebted for many of its achievements. The Carrier Corp., which he helped to found in 1915, has engineered many of the world's most important air conditioning installations and recently secured a \$500,000 contract from a South African gold mining company.

APPROXIMATELY 25,000 tons of rolled steel were used during 1934 in the manufacture of air-conditioning equipment and related products. The industry also took at least 10,000 tons of steel castings, about 5,000,000 lb. of copper and a considerable tonnage of aluminum. Not a bad showing for a business which was only getting a good start when the depression began!

THE WEATHER—

It Takes Steel to Do Something About It

The Air Conditioning Industry Is Already an Important Consumer of Steel and Other Metal Products, and Its Future Potentialities Should Be Considered

By T. H. GERKEN

News Editor, *The Iron Age*

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In 1929, air conditioning was already indispensable in many fields where temperature control is essential to manufacturing processes. It was essential to the tobacco, the meat packing, the cotton and rayon and many other industries, and such outlets still constitute a substantial part of its activity. But the frequent railroad traveler still looked forward with anguish to hot nights on the Pullman, and motion picture theater managers faced the prospect of almost empty houses during the hot summer months even though Mae West followed Garbo as an attraction with monotonous regularity.

Recently, however, the potentialities of air conditioning have gained

tremendous recognition. Along with the airplane industry, air conditioning is frequently hailed as the next great field of American exploitation. "What this country needs to lead it out of the depression," say the amateur economists, "is a great new industry."

The railroads helped along after the terrible seventies, and automobiles were bought by the millions after the war. The radio and the electric refrigerator also helped in the twenties, but the thirties have been uncomfortably barren of that particular type of technical Yankee ingenuity which had usually been able to bring forth new industries to absorb the surplus of materials and labor which the older lines of endeavor cast off in their maturity.

Progress in the air has been rather slow. The general public is hesitant about tossing aside the laws of gravity, even though it does not object to the current style in politics

of abolishing time-honored economic laws with a broad smile and a stroke of the pen. The airplane industry has now thrown off the unpleasant growing pains of its extreme youth and settled down to a slow but steady expansion. It has disappointed those early prognosticators by not turning out to be "the new great industry," but now they have turned to air conditioning.

Figures Not Yet Impressive

The air-conditioning industry, as is the case in other comparatively young fields of endeavor, has not yet built up a reliable literature. Much is being written on the subject, but most of the information must regrettably be classified as propaganda. In the matter of statistics, the industry has little to offer. Its leaders are not especially anxious to reveal their sales volume figures to their watchful competitors, nor do they wish to tempt more people into the field. It can already be said with some degree of truth that every sheet metal shop in the country is in the air-conditioning business and the services offered by unqualified engineers are already doing the industry much harm.

The Bureau of the Census, Department of Commerce, has undertaken the collection and publication of statistics covering "orders for air conditioning equipment," which have averaged about \$1,000,000 monthly in 1934. These sales figures include air washers, fans and unit heaters, and are shown in the accompanying table. Apparently they do not include the apparatus required when refrigeration is provided although this may readily be the most expensive part of a complete air conditioning installation, nor do they cover the heavy cost of installing air ducts for transmission of cooled and cleaned air through a building, theater or plant. A number of large makers of air-conditioning equipment do not report their sales to the bureau, and its figures cannot be considered complete, even though they constitute the only index of actual activity in the field.

Authorities in the industry estimate the total value of its product in 1934 at least \$25,000,000, and if all phases of related activity are included, it may have amounted to \$30,000,000. Thus, the industry has enjoyed its best year since 1931 with sales more than double those of 1932 and 50 per

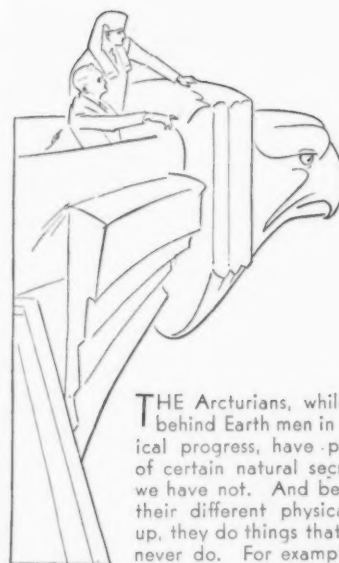
cent ahead of 1933. It is rapidly approaching "normal," while most of the capital goods industries continue to struggle along on a volume of business which has increased very little above the depression lows of 1932. The industry's amazing vitality alone should commend it to producers of rolled steel and castings, copper, electric motors and fans as an outlet which is well worth cultivation.

The average person thinks of air conditioning as some sort of apparatus which will enable him to "turn on the cold" during the summer just as he can now turn on the heat when the temperature begins to decline in the autumn. He has gained this impression in the large metropolitan motion picture theaters and more recently on trains and in restaurants and modern department stores. He thinks and talks about the subject a lot in June, July, August and September and looks forward very hopefully to the time when "air conditioning," as he understands it, will be just as much of a necessity in the summer as heating is in the winter.

What Is Air Conditioning?

The alert merchandisers in the air-conditioning field have been quick to encourage the public. "Choose your weather," says one in its highly enticing literature, while another would like to be thought of as the "world's largest manufacturer of artificial weather." They are all well aware of the fact that cooling is the most spectacular application of air conditioning and are not anxious to emphasize the fact that the average temperature in the most heavily populated part of the United States is too high for comfort on only about 50 days of the year.

Air conditioning actually means much more than cooling. A proper definition is difficult to formulate, but a complete air-conditioning unit would reduce the temperature in summer, raise it in winter, provide moisture for air that is too dry, remove water from air that is too humid, keep the air fresh by means of ventilation and proper distribution, remove dust particles and also eliminate undue noise with, say, a Maxim silencer. Engineers are even working on chemical formulae which will revitalize stale air by means of an electrical process. It can easily be seen that the completely air-condi-



THE Arcturians, while so far behind Earth men in mechanical progress, have possession of certain natural secrets that we have not. And because of their different physical make-up, they do things that we shall never do. For example, these stellar men, when in need of rejuvenation, plunge into the atmosphere of their sun, become incandescent with heat and then, through their power of instantaneous translation through space, plunge into the freezing snowbanks of some polar planetary region. Through this refinement by temperature contrasts, their lives are prolonged almost unbelievably. Arcturus, in viewing this heat-treating scene, notes that Earth men at least do this to metal products.

tioned world will be a pleasant place and that the ghost of Mark Twain will probably retreat in confusion at the obliteration of his famous *bon mot*.

But the great humorist may rest in peace for many more years. The ideals of complete air conditioning are far from realization. Just as the garages of many of the moderately well-to-do can still accommodate that second automobile, so will the great middle class continue to perspire in their homes and offices during the warm summer months for a long while to come. As for the forgotten man; not even Upton Sinclair has thought of having him air conditioned. Manufactured weather is still a very expensive commodity, and the prospect of its being cheapened to a point within the income of even the average automobile owner is none too bright.

Modest Beginnings Essential

The large interests which dominate the industry recognize the necessity of beginning modestly. The public must be similarly educated. A simple humidifier which may be attached to practically any radiator costs very

little. But it makes possible the elimination of the pan of water which used to be standard equipment in every warm-air-heated parlor, and does a far better job. The humidifier of this type is simple in construction and requires very little steel.

A really effective humidifier is more complex and is usually installed in an attractive sheet steel cabinet which will absorb 30 or 40 lb. of highly finished furniture sheets in addition to copper reservoirs and coils, a small electric motor, vapor generating vanes and other small parts. A unit of this type relieves the discomforts of superheated air and refreshes the atmosphere generally by maintaining a constant and satisfactory humidity. The humidifier is the first step in air conditioning. It might well be sold by doctors, for the preservation of health will be one of its chief talking points. On second thought, however, the medical profession should discourage it. Proper humidification will abolish colds and other respiratory trouble!

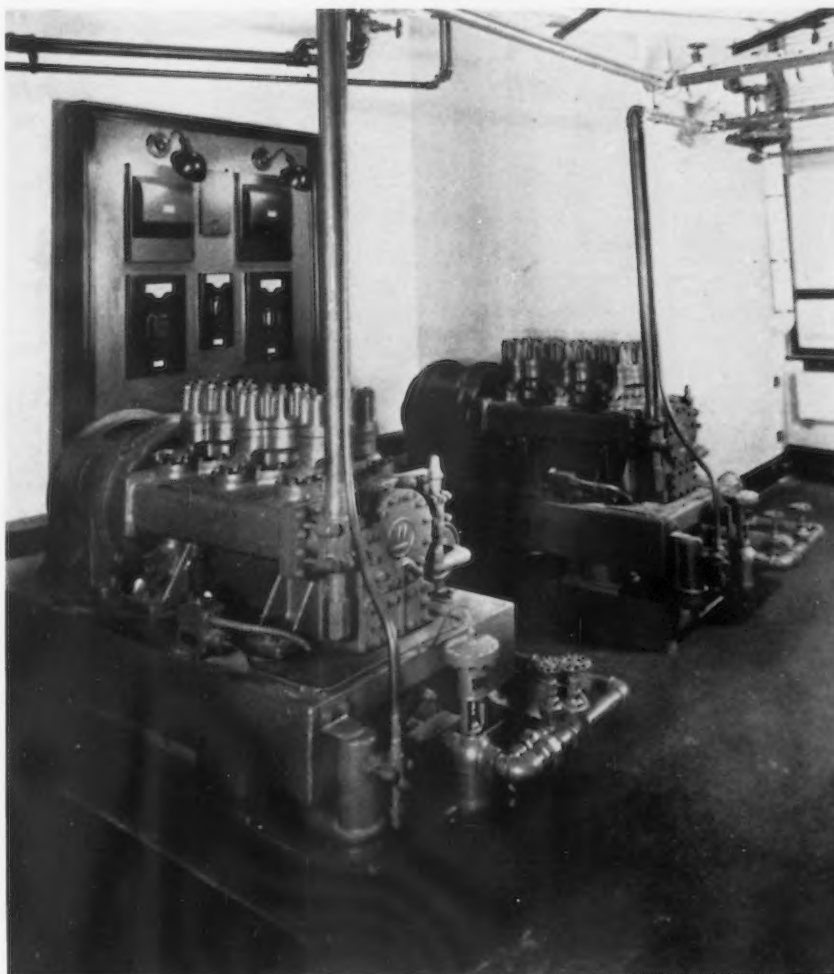
For those who don't object to humidity, but can't stand dirt or noise, small-unit air filters and silencers have been developed. It is also possible to secure these blessings singly and the cleansing virtue may also be combined with a ventilation unit. A Maxim silencer of a conventional type takes care of noise and, in most cases, may be included or left out of either the cleaning or ventilating unit, more or less at the will of the buyer.

Any of these units is ordinarily installed in a cabinet which offers an outlet for full-finished sheet steel. Fans and small electric motors are also needed. Precision is a requisite, for these small applications for domestic and office use must run smoothly and quietly, even with a silencer. The noise accompanying electric refrigeration has long been a bug-a-boo to the business. The outlet for metals is a small one, but the volume of demand for these small, compact and inexpensive articles may well rise rapidly as the public becomes thoroughly aware of this small investment in comfort. Yet it can easily be seen that the manufacture of the small humidifier, cleaner, ventilator or silencer is not likely to become that "next great industry."

The next step for those who insist on doing something about the weather is the small, cabinet-type, air-condi-

tioning unit which takes care of all the difficulties outlined above and also attends to the heating, cooling and proper circulation of air. This unit is suitable for a large room or office and might take care of a small apartment or house. It is about the size of a conventional radiator and fits neatly under a window. An all-year

filters, all require steel, copper, aluminum and other materials. Does the future of the industry lie in this type of unit? The answer is difficult, for there is a tremendous obstacle to surmount. No one has yet been able to bring out an air-conditioning unit which does all of these things entirely satisfactorily for less than \$500, in-



LARGE compressors perform a major function in air conditioning and cooling systems of the closed circuit type. These two 15-ton units supply the necessary refrigeration for the new broadcasting quarters of radio station KDKA at Pittsburgh, which is owned and operated by the Westinghouse Electric & Mfg. Co. The world's pioneer broadcasting station would naturally be aware of the fact that radio artists have to be kept at exactly the right temperature. They also breathe air which has been cleaned and contains just the right amount of moisture. Fans provide for circulation at the rate of 7200 cu. ft. a min. and a cat which happened to slip into the studio would probably be accused of stamping its feet. For sound is anathema to the radio artist, and before air enters the studio of KDKA it passes through a set of sound absorbing tubes. The Westinghouse company is active in the air conditioning field and all the above wonders were accomplished by "home talent."

draftless movement of conditioned air is assured, and, as the unit is completely self-contained, steam, electric and water connections may be quickly made.

This type of equipment compares favorably with the small electric refrigerator in metal consumption. Cabinets, fans, motors, humidifiers,

stalled. Cooling facilities also commonly require a small compressor which can't be hidden under the piano or behind the waste basket.

The entire mechanism is a bonanza to the public utilities, which Senator Norris is constantly taking to task for charging us too much for our electric current. The residents of the Ten-

nessee Valley may soon be able to live in an air-conditioned world without doing without the necessities of life, but the natives of New York, Chicago, and Pittsburgh will have to go on perspiring until the Government gets around to building dams in the Hudson, the Allegheny and the Mississippi.

A self-contained, air-conditioning unit of the type under discussion requires an average of 100 lb. of steel. A good proportion is in the cabinet, which is similar in construction to the ordinary steel radiator inclosure. A highly finished furniture sheet is naturally required. The motor, fan, filter and humidifying equipment are similar to those needed on the smaller individual units which do singly what the combined unit is able to accomplish.

Because of the comparatively high price, volume demand for complete air-conditioning units does seem likely in the near future. Sales have recently been improving and will rise more rapidly as general business gets better. But current application must be in the homes and offices of those in the high income brackets. Increasing volume would naturally lead to reduced cost of production, but the most sanguine proponents of air conditioning do not expect the making of this type of equipment to become America's "next great industry."

Complete Installation

The most familiar and most costly air conditioning is of the closed cir-

cuit type with compressors, fans, humidifiers, and other equipment installed at a central point, usually in the basement of the building. Most of the recent installations in theaters, store rooms, restaurants and other public places are of this type. Conditioned air is carried to the necessary rooms by means of large ducts which are almost invariably of galvanized sheet steel, and, if the installations are large, the tonnage involved may be considerable. In the Rockefeller Center project at New York, over 500 tons of sheets were used, and other buildings take correspondingly large amounts. More than half the rolled steel used in air-conditioning is in this form.

If the conditioning installation is made when the building is erected, the ducts may be concealed in the walls, but otherwise considerable remodeling is necessary. Even then some of the duct work is exposed. In a small installation not much duct work is necessary as the conditioning unit can often be connected with a single register or outlet by which the treated air is forced into the room, while the stale air is ejected through another single opening by means of a fan. Some theaters are air conditioned in this manner, but protection from drafts may be difficult, and proper circulation of the air is just as important as its treatment.

A few hotels and office buildings are now installing complete air-conditioning systems of the closed-circuit

type even though the first cost is still rather high and considerable remodeling is necessary. A revival of private building operations would unquestionably lead to a considerable demand for this type of equipment, and the steel tonnage required would be large. In addition to the sheets required in the ducts, sizable amounts of small shapes and angles are used. The large compressor units are ordinarily built of castings or welded plates and shapes, and pipe and fittings and other metal products are utilized. Compressors alone account for most of the steel castings used by the air-conditioning industry. Here is a large potential outlet for both rolled and cast steel, but it cannot be expected to grow very rapidly.

The steel industry does not benefit by the purchase of heating and cooling coils, which are a part of many conditioning installations, but copper producers do. Many other parts used in condenser units are also of copper, and copper tubing is taken in considerable amounts. Electric motors, which are a part of air conditioning installations of almost any type, also take a sizable tonnage of copper.

More Than 2500 Railroad Cars Air Conditioned

At least 2500 railroad coaches and Pullman cars had been air-conditioned by the end of 1934, and more than two-thirds of this equipment was installed during that year. A number of different conditioning systems

Orders for Air Conditioning Equipment (Bureau of the Census)
(In Thousands of Dollars)

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1931												
Air Washers	88	73	112	90	215	139	104	87	81	98	85	75
Fans	720	629	779	830	831	852	889	621	620	630	642	514
Unit Heaters	547	537	477	574	693	632	803	740	815	848	660	519
Total	1,355	1,240	1,367	1,495	1,738	1,622	1,796	1,448	1,516	1,576	1,387	1,108
1932												
Air Washers	30	69	67	92	111	267	48	35	38	48	72	93
Fans	361	388	383	386	414	452	332	290	334	360	287	230
Unit Heaters	363	246	239	230	270	278	198	221	260	331	311	231
Total	753	703	688	709	795	997	578	546	632	739	670	554
1933												
Air Washers	62	41	60	80	106	111	144	82	94	64	66	50
Fans	209	186	187	235	308	491	437	431	491	373	340	363
Unit Heaters	141	118	103	97	167	200	213	399	287	393	341	346
Total	412	345	350	412	580	802	794	913	873	830	747	760
1934												
Air Washers	57	52	198	261	300	241	254	141	141			
Fans	307	282	353	518	490	518	500	477	423			
Unit Heaters	265	297	329	318	363	335	406	529	534			
Total	629	631	881	1,097	1,153	1,094	1,160	1,147	1,098			



It is easy to see that this room is occupied by a person of considerable importance. He may be a rugged individualist and he may be a New Dealer, but his decisions unquestionably affect the lives of thousands of persons. He is also a wise man, for under his window at the right he has had installed an air conditioning unit which will provide him with just the sort of atmospheric surroundings which he requires to do his work. Neither the roar of an elevated train nor the singing of a lark can penetrate this sanctum and the air is kept comfortably cool and clean in summer and properly warm and moist in winter. The air conditioning industry has made life much more comfortable for this gentleman. This unit was made by the Standard Air Conditioning Corp., subsidiary of the American Radiator & Standard Sanitary Corp., New York.

have been used, and the most satisfactory involve both heating and cooling. The mechanical compressor type has been in successful operation since 1930. Utilization of steam from the train system has also been developed for air conditioning of cars, and ice-activated arrangements have been provided which prove very satisfactory for short runs.

In all systems the utilization of a moderate amount of steel is required, principally in the form of fans, pipe and tubing, compressors and pumps. Scarcely any duct work is needed, and consumption of sheet steel is not large. In view of the fact that more than 46,000 passenger train cars are owned by the railroads and the Pullman Co., their air conditioning should offer a large potential market. Only the precarious financial condition of the majority of railroads will hold back the development, and the large number of cars conditioned last year in-

dicates that even this has not had much influence.

Air Conditioning as an Integral Part of Heating Units

The inclusion of air conditioning apparatus in the equipment of a conventional warm air furnace is also an interesting phase of the growing industry. Humidifying units may easily be installed in the top of such furnaces, and the attachment of an air filter and blower takes care of the cleansing and subsequent circulation of the air through the furnace where it is indirectly heated. Such equipment adds very little to the cost of a furnace of this type. Addition of cooling coils is also practical, and the cleansed and humidified air may be diverted through such coils for cooling in the summer when heat is not being generated. For winter operation a damper may be opened which passes the air directly through the heating chamber.

An installation of this type would probably be the ideal of every home owner. A unit which heats and otherwise conditions the air during the winter and cools it in summer would seem to have tremendous possibilities. Installation in existing dwellings is naturally more expensive and possibly less satisfactory than the building in of the equipment at the time of erection. However, home modernization is still a very important phase of building activity. It is already a great industry in itself, and the work of the Federal Housing Administration has given it tremendous impetus in recent months. There is no reason why air conditioning should not become an important part of this activity, and, if it cannot become "that next great industry" in its own right, it should certainly become a potent factor in the revival of a phase of our industrial life which has always been great.

Housing Program Offers Wider Market for Steel

By L. W. MOFFETT
*Resident Washington Editor,
The Iron Age*

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LARGE potential outlets for iron and steel lie in the Federal Housing Administration's program. These markets are available through both the modernization and construction of homes, and the Administration is cooperating with the iron and steel industry and urging it to stimulate efforts to get the business. It is unanimously conceded that the FHA program is altogether economically sound and offers wide opportunities to private industry and financial institutions to realize fair returns.

Modernization of Non-Residential Structures

It is estimated by the FHA that a total of \$119,918,449 worth of repairs and modernization was created from the beginning of its Better Housing program through Nov. 30. The amount, much of which constituted cash work, represents a little more than five times the amount of the loans reported, aggregating \$21,682,595.

Of the modernization loans, 12 per cent, or more than \$2,500,000, is being spent on apartment houses and non-residential structures such as stores, office buildings, factories, garages, warehouses and other buildings, where steel is widely used. This modernization trend in commercial properties opens up a market for iron and steel in the form of pipe, heating

and air-conditioning plants, elevators and elevator shafts, commercial fronts and decoration, fire escapes, sidewalk service entries, oil and water tanks, pressed steel ceilings, beams, girders, columns, coal chutes, electric conduits, windows, hardware and dozens of similar items.

These improvements can be, and are being, financed by the Modernization Credit Plan of the FHA under the Better Housing program.

Home Modernization

In connection with the modernization of homes, the FHA has pointed out that the iron and steel industry can profit by promotional efforts. Eligible for financing under the plan of the FHA are galvanized iron and steel pipe, heating plants, metal flues, galvanized steel downspouts and gutters, metal casements, steel beams and iron and steel columns for supporting the first floor, metal lath, steel backing for imitation tile and brick veneering, glazed or corrugated iron and steel roofing, corrugated iron and steel garages, fencing, hardware and numerous other lines.

It has been pointed out also that

the sale of steel furniture, even though the Modernization Credit Plan can finance only built-in items, is destined to be stimulated by the Better Housing program. No prop-



FROM whence he comes, Arcturus has not been unfamiliar with alchemists and conjurers. It seems that they have them everywhere. Black magic, white magic and cold magic, he has observed in various phases and varieties. It remained for him, however, to encounter hot magic on the Earth. "The man with the wand must be a powerful magician," says Arcturus, as he gazes upon this scene, sees a dazzling flash of greenish light and is told that broken steel has been mended. His guide assures him, however, that the wand has little to do with it; that the magic is that of chemical reaction. We are not sure that Arcturus accepts this simple explanation. He will probably carry back with him the firm conviction that Earth people are magicians.

erty owner with a newly modernized building, it is contended, is going to expect shabby, outmoded furnishings to look well amid surroundings that are fresh and up-to-date. Rather, it is maintained, he is going to buy furniture if able to do so.

Despite these opportunities, it is claimed that the iron and steel industry, by not promoting as strongly as some of the competitive industries, is allowing many items of construction and modernization that could be made of steel to be displaced by other materials. An example of merchandising activity in developing these markets is the work of the Copper and Brass Research Association, which is said to have brought orders to its constituency for large requirements of pipe.

Lumber also is making great headway as the industry takes advantage of the Better Housing program. The National Lumber Manufacturers' Association has reported that new business in lumber mills and shipments during the week ended Nov. 17 was considerably above the average of the preceding week. The improvement, cited as an indicator, was attributed largely to the Better Housing program. Reinforced concrete also is being marketed in large quantities for purposes of flooring which might well have been made of steel.

Aluminum is being used for structural members. There are cases where steel alloys are obtaining markets, such as nickel alloy for kitchen fixtures. Commercial fronts and trim are taking some alloy steel, but in these fields the use of steel and alloys is held to be considerably less than it might be.

Iron and Steel Industry Takes Action

Efforts to get more actively into the market, however, are under way and the public is to be made more "steel conscious." To this end 192 iron and steel and foundry and related companies have pledged their cooperation by telegraph to the FHA. An outstanding job is being done by the American Rolling Mill Co. through its entertaining "Armco Hour" on a regular hook-up, in which comprehensive advertising is effectively tied up with the Better Housing program.

Of this group of cooperating iron

and steel companies, several are giving practical application to their efforts by modernizing their own plants and encouraging their employees to repair and improve their homes. Among these are the United States Steel Corp.; United Steel & Wire Co., Battle Creek, Mich.; Consolidated Steel Co., Los Angeles; Colorado Fuel & Iron Co.; Buffalo Pipe & Foundry Co.; Blaw-Knox Co., and the Reading Iron Co.

The Home Construction Program

Manifestly, the most important part of the Federal Housing Administration's program is in new construction. James A. Moffett, Federal Housing Administrator, has stated that at least 5,000,000 new homes are needed at once. To indicate the shortage of homes it has been pointed out that less than 50,000 houses were built in the United States in 1934 as against 300,000 built in England with a population of practically one-third of that of this country.

There are many who think that the housing program is easily the leading New Deal bid for a quick and safe business recovery. With the widely ramifying opportunities that it opens, there is no question, it is contended, that it is to the advantage of the iron and steel industry, the metal-working industry, foundries, etc., to work earnestly to get the greatest possible benefits from the program and to assist the Government in getting it

under way. For there has been criticism to the effect that the program, while going over well, is not as far advanced in the construction field as it should be. The criticism has been directed not at the FHA so much as at private interests who, it is asserted, have not been so active as they might have been. They are becoming more active, however, and it is hoped that stimulated cooperation will fend off efforts in some circles to turn to Government financing and subsidies entirely, which would obviously work untold harm to private finance, real estate values and industry. The danger of inflation, of course, lies in such a Socialistic move.

FHA is held to have done the proper thing in giving precedence to modernization because of the vast amount of details that had to be worked out in connection with the construction program.

It has been conservatively estimated that there is an urgent necessity for approximately \$5,000,000,000 of new housing for perhaps the next 10 or 20 years, exclusive of houses required to make up the shortage which accumulated during the depression. This figure, of course, also excludes an estimate of \$10,000,000,000 of needed construction, repair and equipment for industrial plants.

High Costs Prevent Private Building

Complaint has been made that development of a home construction program through private initiative has been prevented to a large degree by high prices of material and labor, as well as by jurisdictional disputes within the American Federation of Labor.

That organization, however, has indicated that with greater and more steady employment assured it would consider what have been called reasonable wage cuts provided prices also were brought down. The financing plan of the program is considered to be altogether attractive.

While it likely will be spring before a widespread home construction program gets under way efforts are being made to speed the work as much as possible long before that, tying it in with modernization to bring about better markets for the iron and steel and other industries, together with larger employment.



Oil Industry Will Spend More for

THE fortunes of oil and gas are becoming increasingly the concern of steel and alloy producers. From the standpoint of metal consumption, the forward outlook in the oil industry, particularly, affords a much brighter aspect than a review of the past several years. Greatly improved conditions in the petroleum industry, after chaotic price situations, suggest increased expenditures in the coming year for equipment and materials. The oil companies, as a group, will probably show a profit for 1934, and will face the new year with increased organization and stability.

The serious problem in the oil industry is the attainment of a better balance between supply and demand. A few statistics on oil present a graphic picture of the general situation today. Annual consumption of crude oil is estimated at 900,000,000 barrels. Daily production of crude oil in October, 1934, was 2,371,568 barrels, according to preliminary re-

port of *The Oil Weekly*. Crude oil in storage as of Oct. 20, 1934, totaled 331,981,000 barrels. Crude oil withdrawals from storage in October aggregated 1,500,000 barrels. Crude oil withdrawn from storage from July to October inclusive totaled 10,000,000 barrels. New crude reserves discovered since 1932 total 600,000,000 barrels. Based on an annual consumption of 900,000,000 barrels, requirements for crude oil in the past 21 months have been nearly three times greater than the new crude supplies developed. Thus, in order to maintain supplies, new crude equal to the annual consumption should be discovered each year.

The importance of those statistics is obvious. First, the quest for new sources must be relentless. Statistics show further that drilling activity is increasing. In 1933, 13,700 wells were drilled. The number for 1934 is expected to reach 17,000 wells. Estimates for 1935 are placed at 18,500 wells. But the significance of

these figures pales somewhat when it is realized that the petroleum producers' problems include not only increased drilling, but also drilling to greater depths before oil can be struck. Ten years ago, the average depth of an oil well was approximately 4500 ft.; this year the average has risen to about 6000 ft., while depths of 7000 to 8000 ft. are not unusual.

Despite the tumult and shouting about conservation, overproduction and possible Government control of oil, the foregoing figures augur well for an increasing consumption of steel, alloys and other metals. Some reliable observers contend that one answer to the oil industry's problem would be the balancing of production according to districts. Such a program in itself would entail an expanding need for metals.

More and Better Steel in Demand

But there are many specific needs that bear comment in this discussion. The trend toward deeper drilling is of direct interest to the steel industry. Oil refineries in their efforts to produce better gasolines are employing more elaborate distillation processes in which high temperatures and pressures are involved. Hence, the demand for heat-resisting steels and alloys for refinery service has become increasingly important. High-pressure materials for refinery use are also in demand for minimizing explosion hazards.

A review of developments along those lines cannot be restricted to the past year. Progress has been gradual. Developments have been proved only after long practical application under the severest tests. Many experimental "strings" of oil country

CONVEYOR systems facilitate the long journey of oil from well to consumer.

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Steel and Equipment in 1935

goods are now in operation, but will not be announced for some months. Metallurgical research is being intensified on heat-resistant and corrosion-resistant metals for tubes for refinery service.

The depression-born necessity for effecting greater operating economies in the oil and refinery fields has placed demands upon metal industries to find new metals and combinations of metals for efficient application. Thus far, it can be said that steel and alloys have kept step in the march of oil back to better fortunes.

Electric Weld Pipe Cuts Costs

Perhaps one of the most outstanding developments in recent years is electric weld pipe. The electric weld process, which permits the use of an unlimited range of metals from low-carbon to stainless steels, has done a great deal to cut losses in the oil industry. Casing and tubing failures during drilling operations are obviously expensive; they are usually caused by the pulling out of the joint because the elastic limit has been exceeded, or by the collapse of casing in the well. Uniformity of wall thickness and concentricity in casing and tubing, which are possible to attain in the electric weld process for pipe making, are considered excellent assurance against collapsing or pulling out. More than 43,000,000 ft. of electric welded casing, tubing and line pipe produced by the Republic Steel Corp., Youngstown, Ohio, has been placed in service in the past five years.

The trend toward deeper drilling in the oil fields may tend to narrow the demand for lap weld pipe, which is more suitable for shallow drilling. Below a depth of 3200 ft., it is believed safer to use seamless or electric

By **GEORGE EHRLSTROM, JR.**
Pittsburgh Editor, The Iron Age

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weld pipe. Lap weld, moreover, is produced generally from 0.14 per cent carbon steel, which limits its weldability. Lap weld pipe has been practically supplanted by seamless for casing, because the latter class can be produced from higher tensile steels and is more suitable for deeper drilling. For oil and gasoline lines, which are subjected to unusual pressures and corrosion conditions, seamless and electric weld pipe are usually being specified.

Substantial Increase in Steel Needs Expected This Year

Casing, tubing and line pipe comprise the largest tonnage of finished steel shipped annually to the oil in-

dustry. In 1931, the oil, gas and water industries took 948,000 tons of pipe and tubing. In 1932, the total dropped sharply to 173,000 tons. A strong recovery in the movement of these products was scored in 1933 when 296,000 tons was shipped. Although at this writing no statistics are available for 1934, it is considered likely that takings by the three industries will show an increase over those of 1933. If present prospects—notably for the oil industry—be materialized, it is predicted by some authorities that 1935 will witness a 35 to 40 per cent increase in pipe and tubing business.

The use of stainless steel and other alloys in the oil fields is increasing, particularly where abrasion resistance and long wear are desirable. Valve stems are being made from a free-cutting stainless steel and 12 per cent chrome steel. Bolts are produced from

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RUNNING Republic electric weld 26-lb., 7-in. O. D. pipe on natural gas well to depth of 5250 ft. in Potter County, Pa.



alloy steels. Alloy cable is employed where high strength is paramount. Forging steel is used largely for couplings. A majority of the tools used in the oil fields are produced from forging quality steel, as well as from carbon steel and chrome alloys.

Steel Improved for Sucker Rods

Sucker rods are being produced from straight carbon steels, carbon manganese steels, wrought iron and alloy combinations. Applications depend upon local conditions at the various oil and gas fields. Suppliers of steel and alloys for making sucker rods are constantly striving to meet the need for resisting corrosion and fatigue. Machinability of the rods also is essential. Rods produced from straight carbon and carbon manganese steel are usually heat treated, while alloy rods may be heated or untreated. The Carnegie Steel Co. is offering its "controlled steel" in straight carbon and carbon manganese steel, expressly for making sucker rods. For upsetting operations, this steel is claimed to be more plastic at forging temperatures than ordinary steel. It is further claimed that the Carnegie product minimizes minute incipient internal ruptures, which result in detailed fractures or failures in service. After the steel is normalized after upsetting, it is said to show exceptionally high impact values. Another advantage claimed for the Carnegie product is low warpage during heat treatment, which suggests low straightening costs and less inherent strains as a result of reststraightening operations.

Wrought iron sucker rods are said also to be performing efficiently and

are strongly resistant to corrosion and fatigue. A more recent development has been nickel-bearing wrought iron for sucker rods. A large independent steel maker is furnishing semi-finished alloy bars for sucker rod manufacture. Other producers are experimenting with sucker rod material, and important developments will probably be uncovered during 1935.

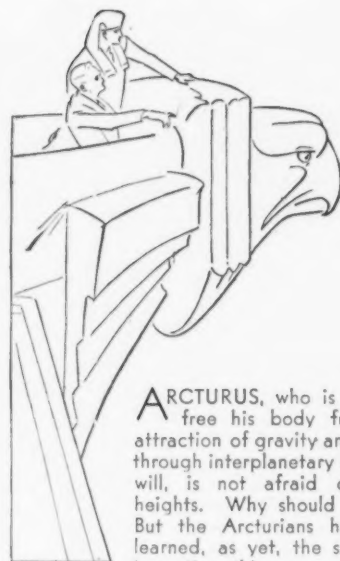
Coping With Corrosion

Where high-sulphur oils, abrasion and corrosion present serious problems to the oil industry, wrought iron tubing is playing an important part. Wrought iron plates are used in the construction of lease tanks located near oil wells and subject to highly corrosive conditions. Wrought iron line pipe is being used in conjunction with steel line pipe, particularly for river crossings and salt marshes.

Within the past year an electro-galvanized thread for flanges, which has been particularly successful in the oil fields, has been developed by the Harrisburg Pipe & Pipe Bending Co., Harrisburg Pa. That company also has developed a high-manganese pump liner for oil field service.

Another trend in the oil country is the increasing application of structural steel for oil derricks; also steel for field houses. Steel in these instances figures prominently because of its portability and fireproof feature.

The fertility of the oil refining industry for alloy steel and corrosion and heat-resisting metals has made the metal producer sharply conscious of the demands for this field. As summarized by H. D. Newell, chief



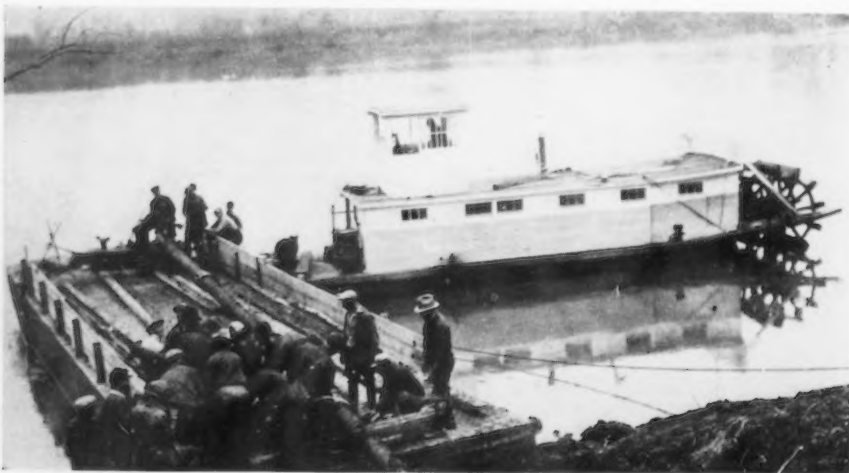
ARCTURUS, who is able to free his body from the attraction of gravity and speed through interplanetary space at will, is not afraid of dizzy heights. Why should he be? But the Arcturians have not learned, as yet, the secret of imparting this power to inanimate objects. They have no mechanisms for lifting and, as a result of this lack, no tall structures. Arcturus, therefore, in viewing this scene, is not impressed with the hazards confronting the aerial iron workers; he is, however, thunderstruck with the Earth man's capability of reaching skyward with steel.

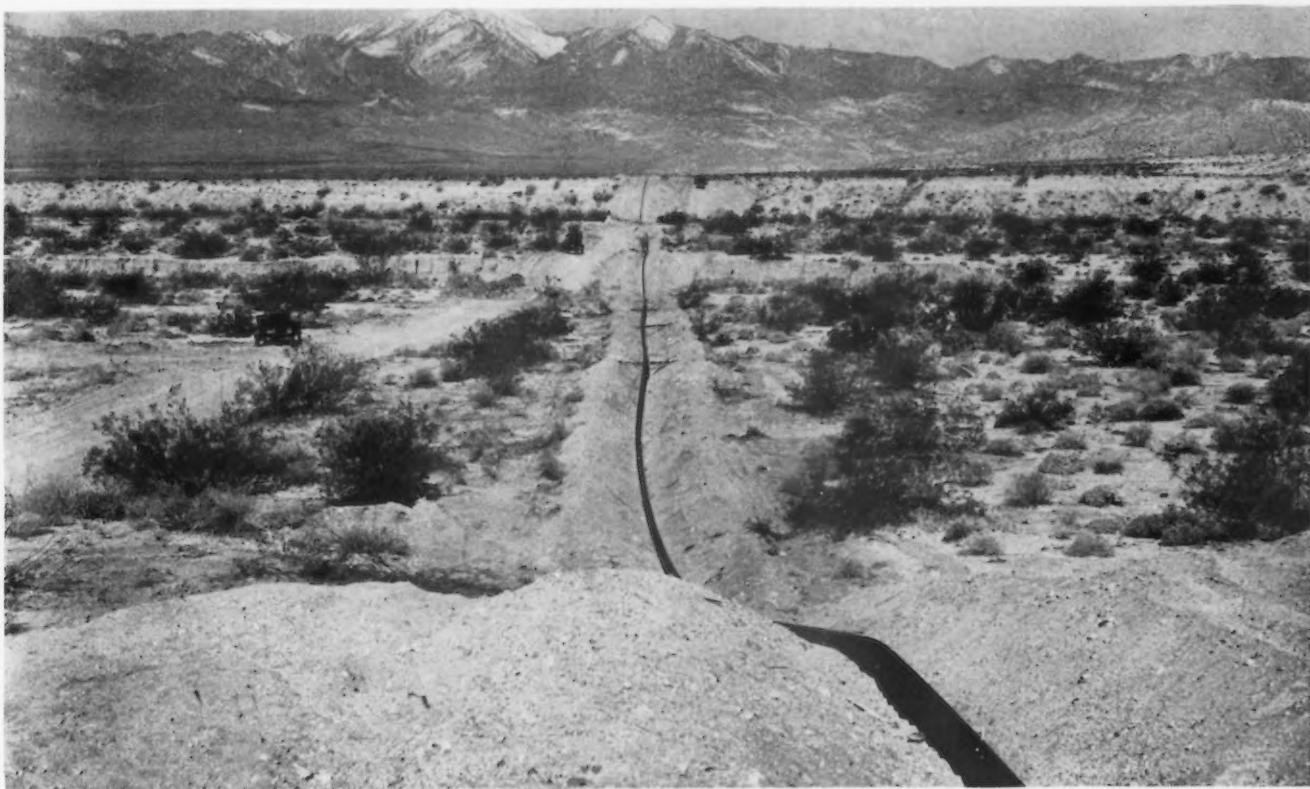
metallurgist, Babcock & Wilcox Tube Co., in the *Refiner and Natural Gasoline Manufacturer*, vol. 12, No. 4, "The refinery engineer now has a considerable choice in the selection of alloy steels for cracking coil tubes, refinery piping and heat exchanger tubes. The primary material for use must be selected with due consideration of its economy, based on corrosion resistance, strength characteristics, general properties and reliability. This in turn calls for a thorough knowledge of refinery practices and of the materials themselves, which necessitates close cooperation between manufacturer and user. Development of new materials and improvement of present ones are thus made possible."

Incidentally, in order to meet the severe demand for improved materials, tube manufacturers and steel producers have cooperated in formulating standards for the common steels. Manufacturers' standard specifications No. 100, 200, 300 and 350, covering plain carbon and 5 per cent chrome tubes of many refiners, were jointly drawn up by producers and refiners.

Another development that has gained increased application is the

RIVER crossings subject line pipe to severe test. Here is shown a line ready to be laid across the Osage River.





PART of a 180-mile steel pipe line on the Pacific Coast serving the Metropolitan Water District, representing 13 cities in southern California.

calorizing of steel tubes for refinery service. Calorized tubes are employed in cracking still equipment where less oxidation and greater erosion resistance to cleaner tube wear are desired. The calorizing process also promotes long-term creep values.

Stainless Steel for Refinery Service

Other applications include stainless steel for refinery service where oxidation must be minimized and where strength must be maintained at

high temperatures, ranging up to and above 2100 deg. F., over long periods. Four to 6 per cent chromium alloys are used for making still tubes, condenser tubes, hot oil and vapor lines, preheater and other transfer equipment, bubble caps, trays and plates, tube supports, hangers and plates, pump parts, fittings, and valves. The Crucible Steel Co. of America, for example, produces 23 different alloys for refinery application.

Experimental work has been com-

pleted by one producer on chromium alloys, showing their economical adaptation as storage tank roofs, as well as upper sections.

An indirect, though growing, outlet for aluminum is in aluminum paint as a protective coating for refinery tanks, etc.

Conveyor Systems Effect Economies in Refineries

Modern refineries have effected economies through the greater use of

MAKING bend on 16-in. O. D. natural gas line of Northern Natural Gas System.





THIS scene is typical of corrosive conditions to which line pipe is subjected.

conveyor systems. This is particularly true in the handling of individual quart cans of motor oil, which have been popularized quite recently. The quart cans, packed in cartons, are conveyed on belt conveyors through sealing and storage operations. Drums, up to 55 gal. capacity, are conveyed and reconditioned on chain-type conveyors. The system illustrated was installed by the Mathews Conveyor Co., Ellwood City, Pa.

The popularity of the individual quart cans for motor oil has stimulated an increased demand for tin plate. In 1934, the shipments of tin plate for this purpose gave evidence of being markedly heavier than that in 1933.

Steel Used for Filling Station Construction

The greater application of steel and alloys in filling station construction must not be overlooked. Stainless steel and enameling iron are being used in some cases as a combination that promotes architectural beauty as well as utility. The heavy invest-

ment feature of filling station construction is of serious concern to the oil company. This problem is being partly met by the use of stainless steel and enameling iron, which, in a sense, make the station portable in the event that traffic, on which the original investment is based, should be rerouted to another highway, thus necessitating the relocation of the filling station.

Natural Gas Output Receding

Prospects for steel and alloys in the natural gas industry are not so favorable as they are in the oil industry. The chief steel product for natural gas service is line pipe, which has been taken in decreasing quantities in the past two or three years. In 1934, few large gas lines were laid. The reasons for the natural gas industry's narrowing steel requirements is readily understandable after a cursory examination of recent statistics. The market output of natural gas suffered a three-year decline through 1933, according to the report for that year of the United States Bureau of Mines. The decline in 1933 was not

so pronounced as in the preceding year, largely owing to a noticeable increase in consumption of natural gas for industrial use. This increase offset an initial drop in consumption by domestic and commercial consumers. In 1931 and 1932 output of natural gas had declined chiefly because of curtailed industrial activity while domestic and commercial use progressed steadily.

Thus, existing trunk lines for conveying gas from producing districts to consuming centers are believed to be adequate for supplying demand at least for the coming year. Hence there is little prospect of any great expansion in pipe line activity. Steel plates for gasholders likewise face no unusual demand for the coming year. The laying of feeder lines in consuming areas presents the most likely prospect for any tonnage of steel pipe in the gas industry. On the other hand, if the general rule be applied to the effect that "Where there's oil, there's gas," then a substantial demand for casing and tubing will be continued.

No Marked Expansion of Water Systems Looked For

The trend of steel consumption in the water industry brings little cheer to steel producers. Current water supply systems are considered by some authorities to be wholly sufficient to satisfy demand for some time. Thus prospects for early expansion in this field are far from favorable. Steel for water-carrying lines has not yet found general acceptance, although one of the largest pipe orders placed on the Pacific Coast in 1932 called for 180 miles of 5 and 8-in. electric weld pipe for the Metropolitan Water District, representing 13 cities of southern California. During the drought in the summer of 1934, steel pipe lines that had been laid for transporting gas or oil were used in several cases to carry water to some drought-stricken areas; but this service for steel pipe was chiefly of an emergency character and not exploited as a permanent utility. Other outlets for steel in the water industry are water tanks, stand pipes, and such building construction as is incidental to large filtration systems and softening plants. The water industry is an important field for wrought iron pipe.

SECTIONS of 8½-in. O. D. line pipe with river clamps attached ready for river crossing.



Progress of the Die Casting Industry

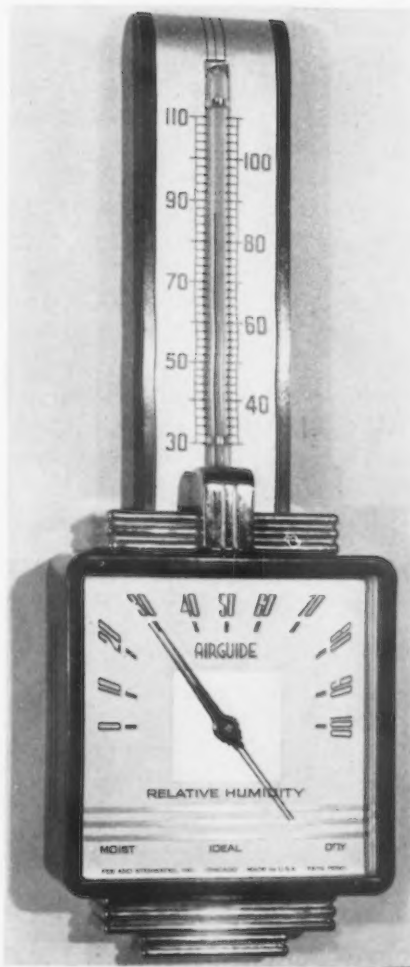
By L. M. WAITE

THE story of die casting industry accomplishments has competitive angles peculiar to developments in that particular field of effort. These form a record of determined forces constantly in play for the reduction of costs and the building up of demand thereby.

The story also records sales resistance, propagated through skepticism, disdain or what-not, on the part of like-purpose industry—sales resistance via the “doubting Thomas” route—emphasized doubts, inspired by envisioned loss of business and customers.

This record has concerned quantity production of duplicate parts from metal, and a competitive process which has been of an upsetting character in the matter of parts-procurement from the previous and widely accepted supply sources. These sources, with large investment in equipment, had come to regard their supply position as an almost sacred prerogative of the “metal working industry,”—a ranking industry because of its speed, accuracy and determined progressiveness in production.

Capable engineers and persons well versed in the scientific side of die casting have written well and often concerning technical involvements, and



THE touch of the artist is in evidence in this die cast unit.

HERE is a somewhat unusual story. It tells how an industry which started as a competitor of the metal-working field has made itself an integral part of that industry. Today, instead of being regarded as a menace to the progress and profits of other branches of metal-working, die casting is an appreciated member of the family, performing a recognized and most useful service and doing its full part toward the up-building of the industry as a whole.

so it is possible that now a close-up review which ignores technicalities of a metallurgical sort and design details of a precision nature, may be of interest, presented from the enterprise angle of competition, sales resistance, and a struggle for industrial recognition.

The industry had definite phases in its development. Its commencement date is set at a time, when as a youngster, it was real contentment to sit atop a long, high board fence which separated two residential properties in Oberlin, Ohio, and watch “Charlie Hall” with his backyard fires, his tin cans and defective pots and kettles of discarded kitchen variety, as he compounded and cooked, seemingly, all kinds of mysterious mud-pies. It is recorded that these activities constituted the birthing of commercial aluminum, now a base for certain die-casting alloys.

High research authority has recently stated that the accumulation of scientific knowledge as to combining metals to obtain alloys essential to successful die casting, which alloys are largely responsible for today’s accomplishments—would have been long delayed, had it not been for the results obtained by Hall in his effort

to find the secret of light, strong metal.

Early Lack of Stability

THE modern manufacture of die castings is a developed process of making duplicate parts from molten metal, in a steel die, under pressures and on machines of largely composite design, embodying mechanical and operating features which have been found to give the best practical results.

At its advent, aluminum was considered, possibly too hopefully and hurriedly, to be the salvation-alloy medium for a number of existing harassments. It was thought that wide industrial acceptance and large cost reductions would or might develop from the alloying possibilities visualized. However, with experience, it was found that major difficulties of a serious nature must still be met, due in a large measure to a lack of either form or dimensional stability, such as might be peculiar to the particular alloy used. Rejections because of instability were not necessarily determinable upon ejection of the product from the dies. They might develop even weeks after casting, due to changes characteristic of metal alloy elements.

Engineers and designers, many of whom are still active, set about the supposedly curative task of so perfecting equipment, dies, and heat control methods, that die cast pieces would possess the reliability, for example, of screw machine products. In other words, they instituted an endless search for such design and mechanical perfection as might be said, with reasonable probability of belief,

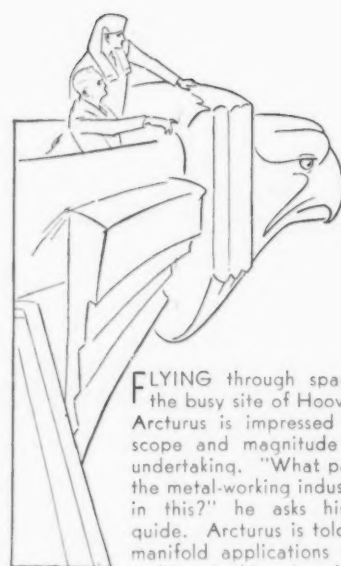
to control these troublesome characteristics of die cast products.

The lack of stability and the dimensional difficulties were decidedly sales-damaging because they became widely recognized through the filling of early orders and through the headlining of the detrimental facts, quite often exaggerated, by competitive industries, which stood to lose much in the way of volume-business and business-volume, to successful die casting.

Early Orders—and Later

IN its search for orders, the die casting industry naturally solicited largely on the basis of substitution for more costly and heavier products, especially after the advent of aluminum alloys. In so doing, it was inevitable that its principal contacts should be with persons who had long dealt with problems of metal production, and whose difficulties revolved around variations in "accuracy" rather than around "instability." These persons were accustomed to translating the solution of their problems into plus and minus decimals; their instruments of acceptance and rejection were of micrometer graduation, and their experiences in deviations from plus and minus decimals had been sufficiently disastrous for them to insist that "tolerances" should be written into the vocabulary of the die casting industry.

With a hope stimulated by desperation, the challenge was accepted, and the net result was additional damaging orders—but it can certainly be said that in many cases, tolerances within uncalled-for limits were specified, and rejections were based thereon. Additional reactions from



FLYING through space over the busy site of Hoover dam, Arcturus is impressed by the scope and magnitude of this undertaking. "What part does the metal-working industry play in this?" he asks his Earth guide. Arcturus is told of the manifold applications of steel and iron in this enterprise, from simple reinforcing bars for concrete to the great hydraulic turbines. He is told of the huge penstock sections, 30 ft. in diameter and made of welded steel plates of nearly 3-inch thickness. Becoming interested in this subject, he is taken to the huge refractory lined, stress relieving furnace and sees one of the penstock bend sections emerge, carried upon the great car that forms the floor and door of one of the largest ovens yet made by man.

further advertising, served to set up a very considerably increased sales resistance in the direction of unreliability, which still seems to feature the opinion of many potential users of die castings. On the other hand, progressive management, always alert in the matter of cost-reduction possibilities, has been quick to avail itself of the new stability uncovered by metallurgical research, and has become an expanding user of die cast parts.

Automotive organizations feature die castings to an extent which may well amaze those who are possibly less informed, or who hold to earlier conceptions regarding the use of certain metals. Marvelous results in finish have been evolved, and this single feature has been very closely related to attractive presentation in competitive sales effort.

The Die Casting Industry Makes Its Own Machines

IT can be quite reasonably stated without much expectancy of successful contradiction, that the die casting industry has pioneered its own



• • •
A CIGARETTE
Lighter —
Doehler
• • •

machines. These have very largely followed a general trend in design, which may or may not have had origin in foreign machines, utilized by those of other nations who had long sought to accomplish successful die casting. The point here is, that the industry has made its own machines. The reason is of little moment, nor is it particularly important to determine whether the machine tool industry kept away from the manufacture of die casting machines because of competitive fear, as is sometimes charged. The industrial effect has been that the die casting industry offered relatively little to the machine tool industry in the way of machine-building activity. In this way the die casting industry may be said to have failed to secure the advantages of machine tool building experience, and to have become competitive with, rather than a large customer for machine tool industry equipment. Particularly has it been competitive with the screw machine division, and with makers of second-operation machines.

Equipment Offered

THE manufacture of die casting machines and equipment for the market is of comparatively recent date. Several makes are offered, including automatic, semi-automatic, and hand-operated types. These offerings are largely by firms who cater to die casting work as well.

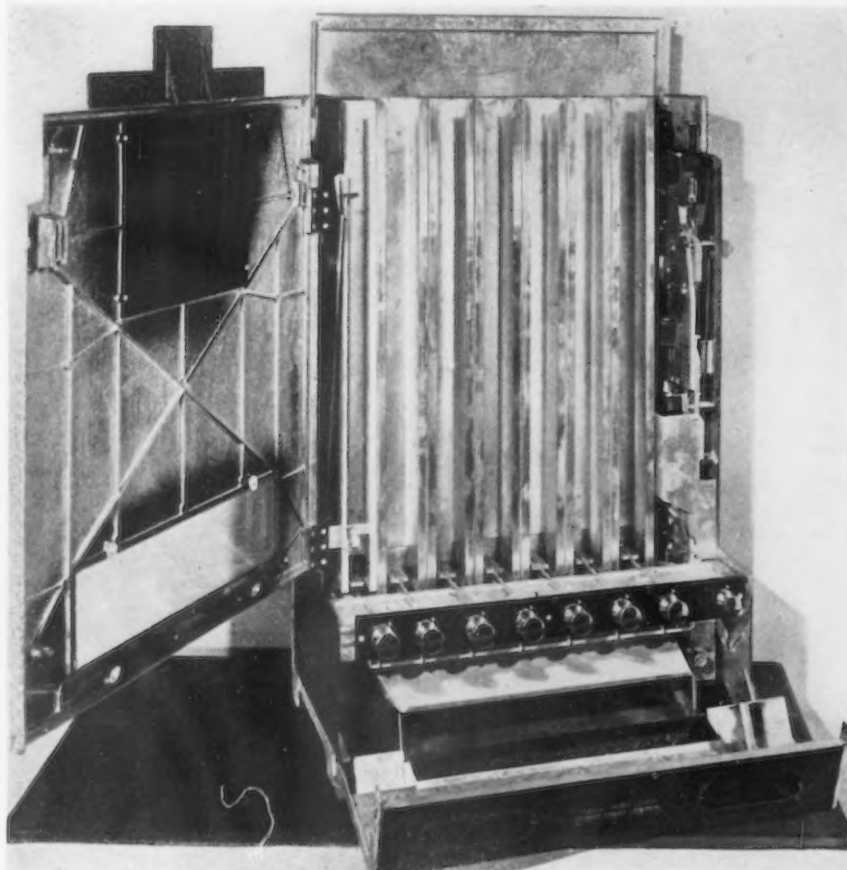
The hand-operated and semi-automatic types can be said to have a large following, because of the fact that their use permits retention of operating "feel"; that is, the operator can detect the existence of any bind or jamming condition which might otherwise result in die damage. On the other hand, automatic machines have a recognizable advantage in power "pulling" for die opening and core pulling operations.

The word "automatic" in die casting parlance does not seem to have exactly the same significance as indicated by its use in connection with screw machine equipment, for example, in which field of production, one operator takes care of several machines. However, it does indicate, admittedly, a very probable or possible reduction in the amount of operating help required, particularly in the heavier work, where die opening and core pulling often necessitate quick application of brute strength.

Merits of such contentions which represent the opinions of experienced producers and operators, are of little importance here, for it is intended only to call attention to the fact that progress has been sufficiently marked to create an optional purchase condition in any equipment selection.

Without going into details of betterments or control improvements, which are of undoubted major importance throughout the entire in-

itself in modern die-casting equipment; which, of course, includes dies; nor is it a brief for research accomplishment in die steels, nor in experiments in the field of pressure applications and control mechanisms. These have had a very direct effect upon the continual reduction of human fatigue as an operating factor and have served well in confining the hazard of molten metal. However, these things cannot be said to be im-



◦ ◦ ◦ A REMARKABLE demonstration of die casting possibilities. A cigarette vending machine.

dustry, it can be said that their existence is well demonstrated by the fact that one manufacturer markets a so-called "Kaster-Kit" with which youngsters actually cast their own soldiers, animals, automobiles, etc., with about the same degree of safety that is involved in the youngster-use of any of the more familiar mechanical toys. This Kaster-Kit is distributed by one of the largest makers of toys, and is said to have ready sale in almost any toy department.

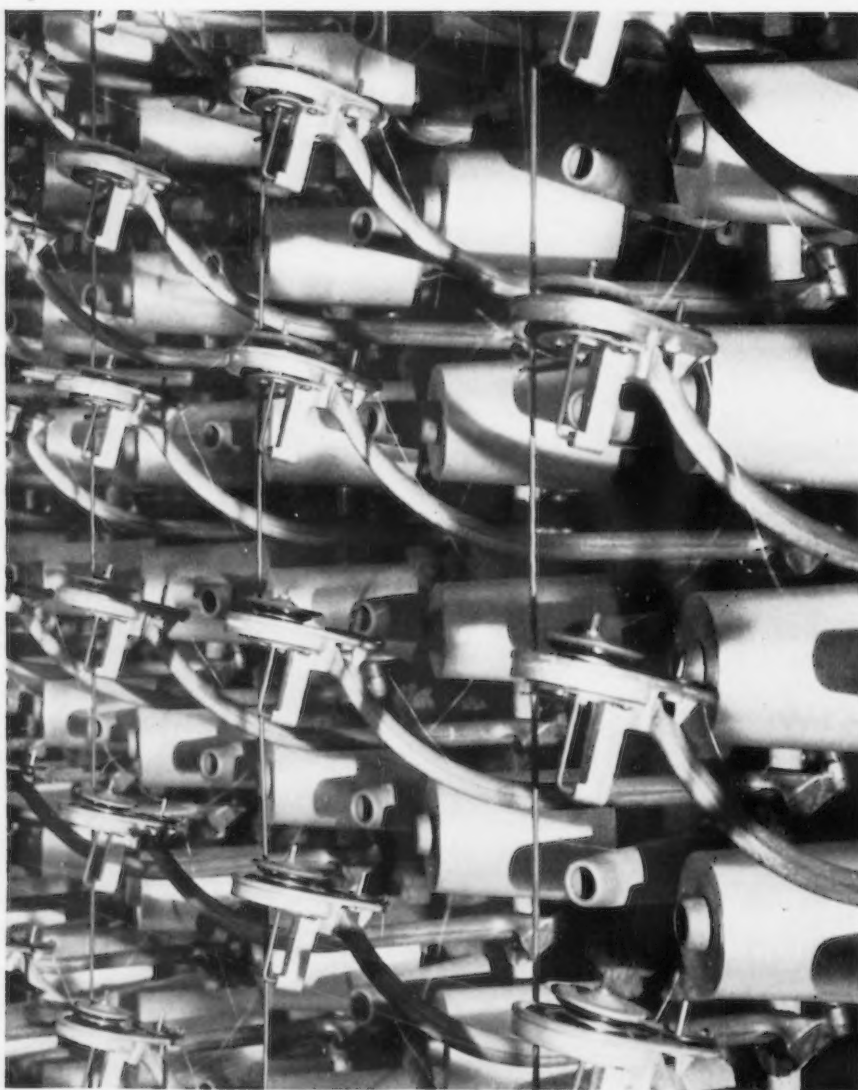
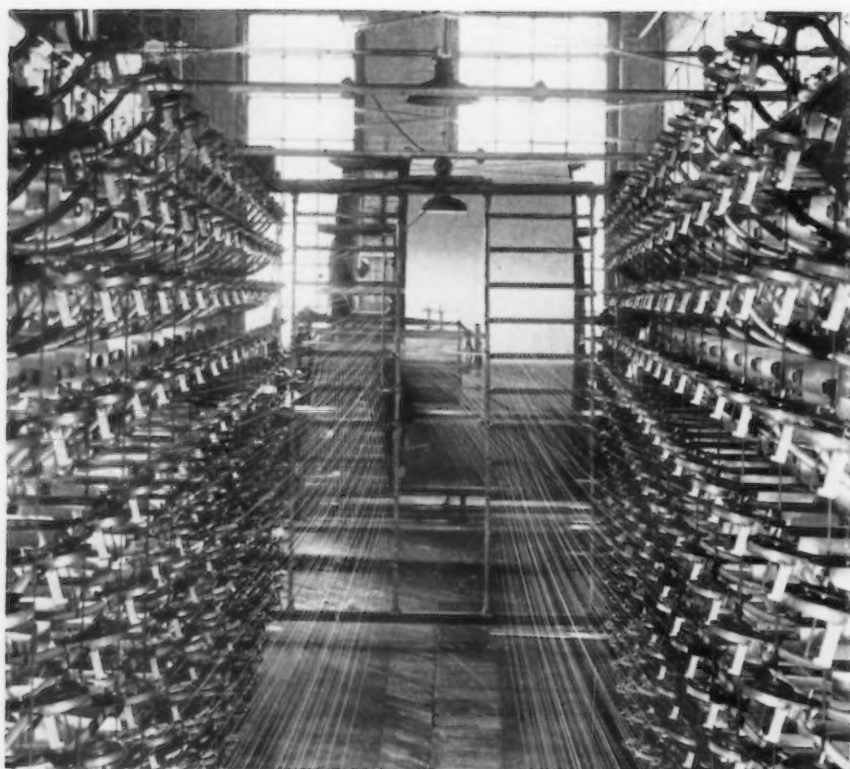
Fatigue, Hazard and Utility

THIS story is not concerned with apportioning credit for the enterprising genius which has manifested

pressively important in connection with the control of metal characteristics, over any considerable length of time after the die-cast product is ejected from the dies; which control in the final analysis, is the major factor in the industrial utility of die castings.

"Mystery" and Research

RATHER suddenly, due to the fact that research had very largely removed the impurities from zinc, the period of a marked improvement in the reliability of die castings with respect to stability and tolerances, arrived. The makers of the various



types of machines which were used in individual die casting shops (keeping in mind that die casters made, and were secretive regarding, their own machines) at first said little as to the real cause of the bettered condition. They were inclined rather to keep alive the heretofore prevailing element of mystery in the production of die castings. For naturally, each desired, from purely competitive instinct plus a certain amount of order-desperation—that the opinion should prevail that the suddenly bettered quality and stability, and later the largely widened range of product, was a fruit of his own particular ingenuity as applied through the use of his individual equipment, appliances, and control methods. The equal of these, it was frequently suggested, would not be found available for use in competitive shops.

Up to this point, a low grade of zinc had been used as a base in the alloying of certain die-casting metals. The New Jersey Zinc Co. led the way in metallurgical research and in cooperative effort with die-casting manufacturers, in the determination of alloys using a high grade zinc base which might avoid those characteristics of instability which had grown gray hairs upon the head of the die casting industry in the United States, before it was 25 years of age. The results of this research took the "mystery" out of die casting, and made high grade zinc a major metal in die-casting alloys.

Today's Alloying an Achievement

TODAY, quite regardless of who may claim or be entitled to credit, this cooperative achievement makes it possible to inject molten metals under pressure into steel dies, pressure operated, with a very decided assurance that the product so cast from properly formulated alloys or metals will faithfully and accurately reproduce and indefinitely retain the specifications imparted by dies of correct design and with a degree of success necessary to maintain large volume production through repeat orders.

The solution of the alloys problem

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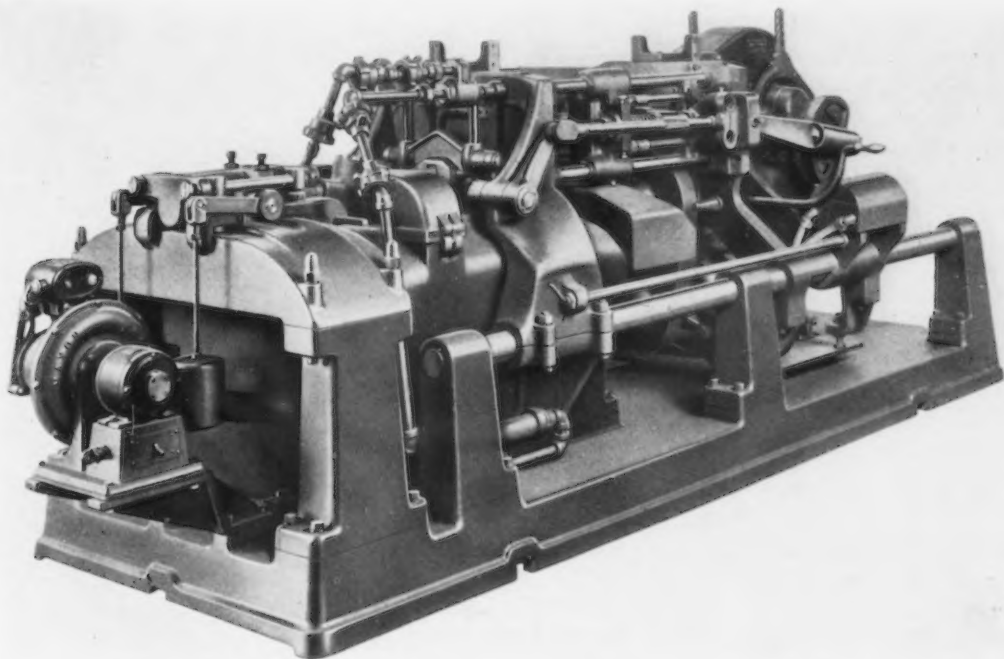
A NEW application of die casting assembly on new textile equipment. The 360 arms and the supporting members are die cast. This is only a small machine as textile equipment goes.

has been no small achievement, involving as it has elements of stability, pressures, temperatures, feed, reliability, accuracy, fluidity, tensile and impact strength, hardness, rugged life, machinability, finish, etc., in conjunction with base uses of tin, lead, zinc, aluminum and copper. The metal range attained has given strength-properties all the way from those of lead to the bronze-castings tensile

tions of such products as die-cast clocks, electrical fixtures, toys, novelties, automotive hardware, cigarette lighters and cases, compacts, powder boxes, dressing table accessories, electric horns, auto-heaters, thermoservers, ashtrays, lamps, plumbing fixtures, radiator ornaments, refrigerator hardware, gasoline pumps, cameras, picture frames, display holders, locks, etc. Such reference will

moving the atmosphere of the shop; cowl bars and ventilators, choke and throttle parts, door handles, hinges, headlights, heater parts, instrument panels, cases, license frames, radiator caps, moldings, rear-vision mirrors, robe rails, wide wing-brackets, hub caps, escutcheon plates, etc.

If a list of artists who have joined the industry were to be checked for recognized quality of work, the names



AUTOMATIC die casting machine for zinc, aluminum, lead and tin alloys. Weight 14,000 lb., length 13 ft., width 4 ft. 3 in., height 4 ft. 4½ in. Gooseneck capacity 7.33 lb. in zinc, 3.15 lb. in aluminum. Double capacity gooseneck can be applied.

strength and toughness which approximates that of steel itself.

Nor is die-casting research completed; for, already, persons highly rated in the realms of practical, mechanical and metallurgical research are thinking in staggering terms of future increases in "shots" per minute per machine, with equipment of automatic design.

The Artist Consultant

THE die casting industry has not disregarded the fact that buyers are becoming design-conscious, and that as a sales asset "appearance" when combined with utility, is the highway to orders—the highway with the fewest detours.

The effectual value of the artist-consultant is possibly best realized through reference to almost any collected display of recent trend, finished products or photographic reproduc-

attest the sound judgment of the industry in bringing the "artist" directly into many of its organizations and into close consultant-association in many others.

Nor is there any evidence that this move has been unwise from a viewpoint of bettered appearance in a somewhat different listing of die-cast products or mechanisms which feature assembly with die-cast parts, such as wood and metal working equipment, washing machines, kitchen and beverage mixers, razors, cash registers, taximeters, typewriters, fuel pumps, pencil sharpeners, hand tools, vending machines, refrigerators, counting devices, slicing machines, package sealers, food mixers, etc.

The modern automobile presents a collection of die-cast products, some of which most certainly involve the cooperative skill of the artist in re-

would reveal an industrial trend highly creditable to the foresight of management.

1934 Not a Lost Year

WHILE there may be few announced major progresses with which to credit 1934, it is a consensus of opinion that the activities of the year portend important announcements during 1935. Recognized development work, specifically relating to heavier pressures against molten metal in feeding, was aimed toward a more plastic condition of molten metal, at the time of casting, in order that the die-heat factor should be reduced to a point less detrimental to die life.

Metal containers, used in feeding processes, were subjected to combinations of previously accepted feeding procedures. One of these, a combination of gooseneck and plunger sys-

tems, was featured by a machine builder as providing a unit requiring only a minor change to cover a shift in alloys used. Another machine manufacturer announced a line of two machines,—one for aluminum and brass, and one for zinc castings, having an available pressure of 17,000 lb. per sq. in., should such pressure be needed. In this pressure feeding the molten metal is ladled into a plunger cylinder. The machine was described in *THE IRON AGE* of Nov. 29, 1934.

Another feeding presentation, described in *THE IRON AGE* of Jan. 29, 1934, stressed the entire elimination of pressure as a feeding element, substituting therefor a procedure which might be called "submersion." This procedure involved raising of the level of the molten metal to a point above the die and permits the die to receive metal from beneath the top surface, where oxides collect.

These developments were more related to specific alloys than they are as yet adaptable for universal use.

Air Expense Reduction

ANOTHER manufacturer effected a reduction of air expense in feeding. He brought out a secondary air cylinder into which is by-passed air used in the down stroke of the

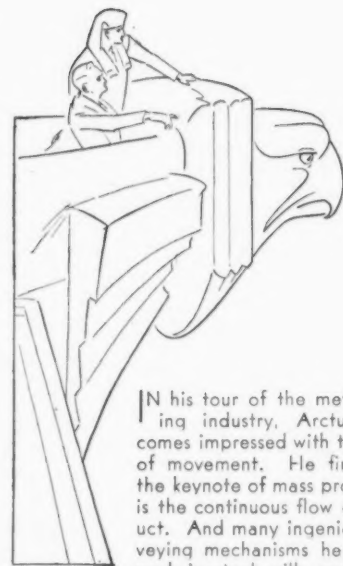
ram which serves to fill the plunger cylinder with molten metal. While the by-passed air retains only an approximate 50 per cent of the original pressure, the 50 per cent is more than sufficient for the up stroke of the ram in preparation for the next down or pressure stroke. In this manner the cycle of feeding is accomplished with one "shot" of air.

Design improvements, die locking betterments, and a reduction of power requirements for core pulling and die ejection, served to considerably increase permissible internal depths and made entirely practical, for instance, the die casting of housings for machine members and mechanical units.

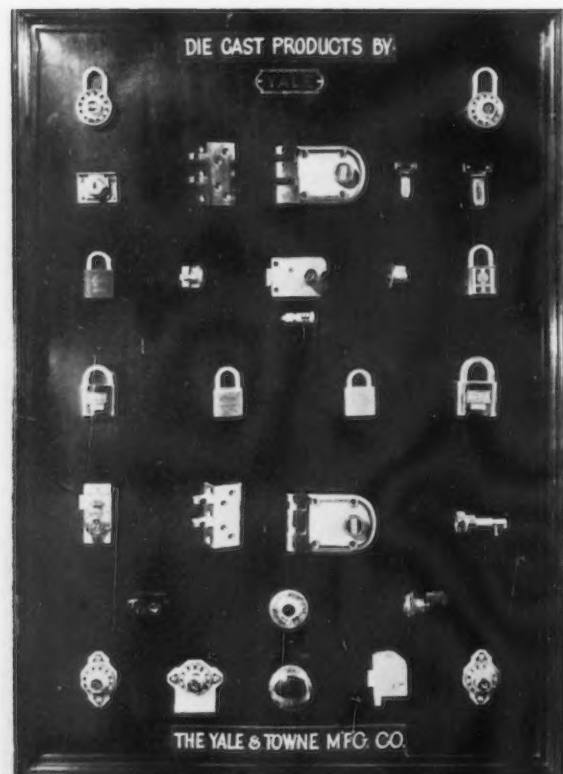
Die steel manufacturers were co-operatively active, especially along lines of heat resistance for the elimination of "checking" in die metal. Much progress was made, but it was not announced that heat limitations had been conquered. However die steels were a factor in thinner walled sections.

Assembly Use Developments

THE adoption of die cast parts, in many and various assemblies, in the place of or in conjunction with materials long considered to be standard for component parts use, passed the
(CONCLUDED ON PAGE 246)



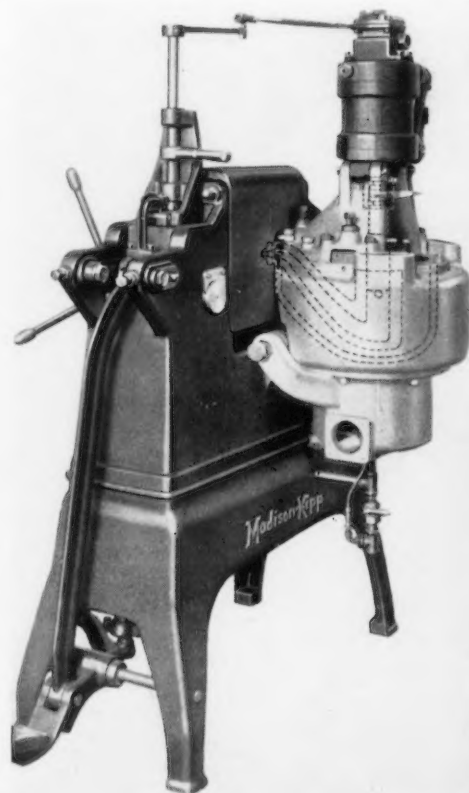
IN his tour of the metal-working industry, Arcturus becomes impressed with the spirit of movement. He finds that the keynote of mass production is the continuous flow of product. And many ingenious conveying mechanisms he sees at work in steel mills and metal-working plants. These, he discovers, convert the plant almost into one huge continuous mechanism, with raw material entering at one end and finished product leaving at the other. In this picture, you, with Arcturus, see hot strip steel being rolled, then twisted from a horizontal to a vertical position by ingenious conveying mechanisms; delivered in strip form to a cooling conveyor; coiled and the coils carried to the delivery department.



AT LEFT
LOCK and dial applications of die cast assemblies.

o o o

AT RIGHT
A FOUR-BAR die casting machine, semi-automatic, manual die operation, plunger type, furnace capacity 200 lb. This machine has an auxiliary air chamber for using by-passed air in a lifting movement preparatory to charging the plunger cylinder. Weight 2200 lb., length 8 1/2 ft., width 3 ft. 7 in., height 5 ft. 9 in. Interchangeable plunger and plunger cylinder.



Mounting Overhead Expense Spurs Handling Progress

By JOHN A. CRONIN

IN our next issue our survey of the cost of the New Deal will reveal that remarkable progress has been made by management in the reduction and control of overhead expense. The spur to this accomplishment has been the universal rise in wage rates.

A part of this saving has been due to the increased absorption of improved mechanical handling methods during the past year, as Mr. Cronin points out in this article. Considerably more activity is apparent in the materials handling equipment industry than has been the case for several years and the outlook is bright.

DURING the past year the materials handling industry has been slowly but surely turning upwards from the darkness that characterized its activities during the sorrowful years of 1932-1933. In the closing months of 1934 there has been a prevalent feeling that the inevitable working of economic laws is resulting in the development of a trend towards more liberal purchase and use of those types of materials handling equipment and methods which offer broad avenues of cost reduction.

To quote the language of one of the most prominent manufacturers in the industry, whose statement epitomizes the feeling of many of the rep-

resentative executives who were interviewed by the writer during the past few weeks, "it is my opinion that the most definite turn in the materials handling field in the past year has been one toward more cost reducing machinery." This same executive points out very clearly that during the early months when code making activities occupied the attention of all leaders of industry, many manufacturers, especially in the lighter manufacturing fields, were inclined to feel that the Government's action would tend to raise and maintain prices at a level sufficient to gild over any minor deficiencies in their materials handling processes. During the past few months, there could be sensed quite definitely a trend toward more and more common-sense methods of operation. As raw material and labor costs have risen under the pressure of NRA requirements, production superintendents have again become very much interested in cost reducing plans.

In spite of Utopian dreams, it is still an undeniable fact that any business enterprise which is not operated at a profit offers no fertile field for employment of labor. Furthermore, it is just as true as ever that the shares of both employer and employee depend upon the amount of value which is added to the materials upon which the operatives work. Unnecessary handling adds to the cost of handling and of distribution; consequently it directly affects the welfare of both employers and employees.

Profits Essential to Employment

ONE of the contributory factors in this changed viewpoint of industry in relation to the use of materials handling equipment has been the shorter work week. Due to the uncertainty in regard to future conditions under which business may have to operate, demand for handling equipment has been spotty. A similar spottiness has been noted in general business. As a result, a good per-

centage of orders has been of the "rush" variety. The combination of short hours, overtime pay requirements of the codes and necessity for hurried filling of such orders as are received has made efficiency in handling all along the line a general necessity.

PWA Has Helped

THE public works program of the Federal Government has contributed in no small measure in adding to the sales totals of various lines of handling equipment. Requirements for CCC camps and for Federal emergency relief work were reflected largely in the demands for the lighter types of materials handling equipment, notably wheelbarrows. Many of the new post offices furnished outlets for casters, floor trucks, trailers, conveyors, scales and other equipment. The outstanding crane order of the year was for the power house at Hoover Dam, a single order covering a quarter million dollars worth of this type of machinery. There was an upward trend, too, in the curve of buying of equipment for railroad terminals, reflecting itself in some welcome orders for industrial trucks and trailers. The labor outbreaks, particularly in West Coast shipping circles, militated against good business for materials handling equipment in a direction in which there had been considerable hope for improvement.

In the general industrial field, the return of the breweries and distilleries to active operation in the preceding year opened new markets for a wide variety of handling equipment, including new applications of pneumatic conveying for handling malt and other cereals, various types of bucket and other conveyors for

bulk materials, coal and ash handling equipment, package handling conveyors, lift-trucks and portable elevators and weighing equipment.

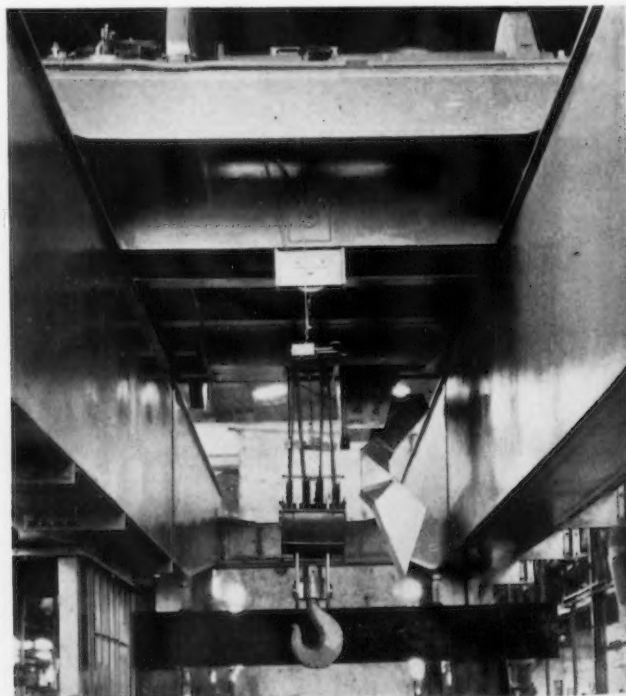
While many well-known manufacturers of materials handling equipment have reported no new or startling developments in their lines, there has been, nevertheless, a sufficient number of new products announced within the year to demonstrate that the lack of anything resembling normal business has not discouraged the industry; rather, it has been an incentive to research and development work. This latter has resulted not so much in any radical new types of equipment as in the addition of refinements here and there in the general line.

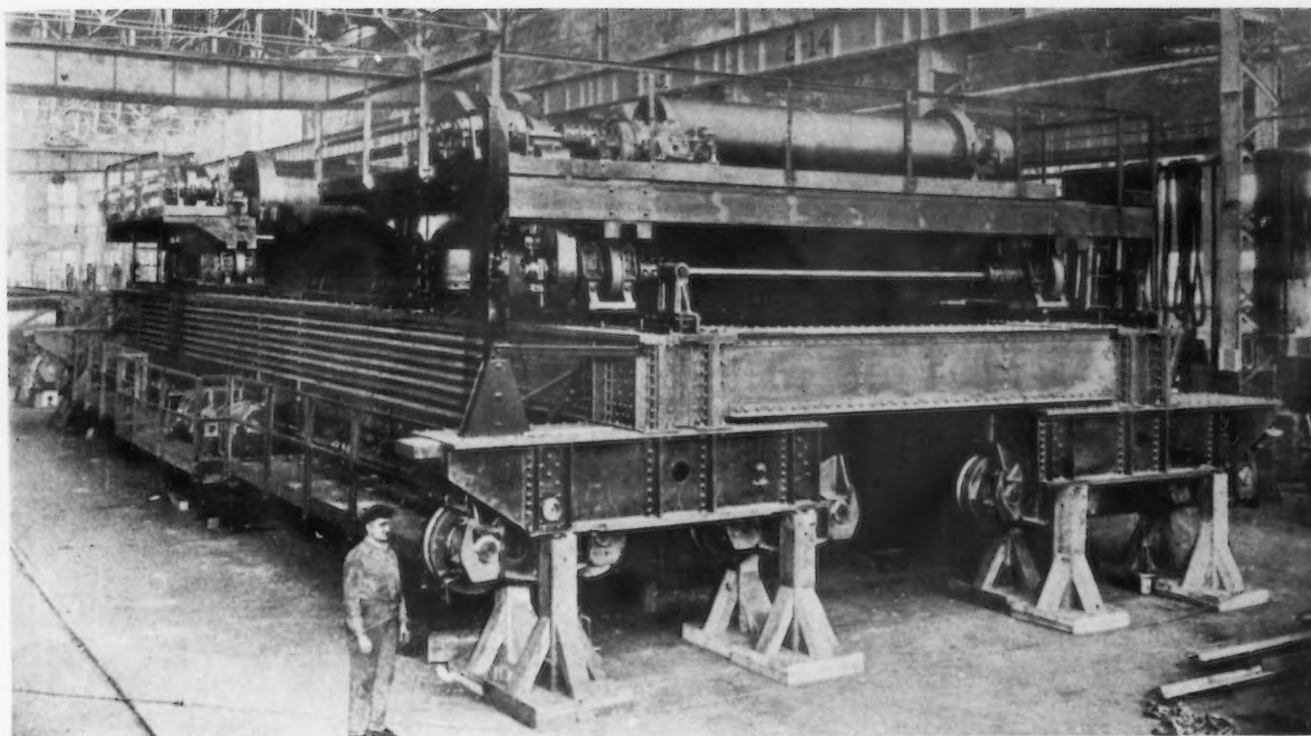
Streamlining Becomes Practicalized

IN railroad circles, as well as in the automobile field, 1934 was marked by the arrival of streamlining from the stage of novelty into one of accepted practicability. Lightweights, featuring speed, made their bow in the passenger field as one of the answers of the railroad executives to competitive forms of transportation. In the freight handling end of the business, in spite of low revenues and mounting fixed costs, a real start was made. Bearing eloquent witness to this are announcements, such as that of the Pennsylvania Railroad that heavy increase in the average loading

of its freight cars carrying L. C. L. merchandise has resulted from a system-like campaign to get more work out of each individual car; and that the Baltimore & Ohio Railroad has set up a bogey of 5 tons of revenue freight to 1 ton of dead weight in freight cars as a destined goal. As an example of practical possibilities along this latter line, a hopper car of aluminum alloy was built early in 1934 with a weight of only 27,700 pounds and load limit of 141,300 pounds. Another example is the construction of two hopper cars out of a high-tensile corrosion-resistant steel, with ratio of revenue load to weight of 4.42 to 1 and 4.28 to 1, respectively. These developments are cited because there are well informed persons who believe that revolutionary changes in methods and equipment in freight handling in this country will return to the rail carriers much of the revenues that were lost by them to other forms of transport. The Eastman commission has been building up a vast store of practical data regarding physical handling of commodities, including methods and equipment. While it is too soon to indulge in wild guesses as to the results of this research, it is not chancing too much to predict that the next decade will witness marked advances in the direction of coordination of handling that will reach back to the plants of production and carry

IN this new load weighing development, the entire load is suspended from the scale and readings are visible from the floor.





through until the goods have been delivered to final destination.

To illustrate the possibilities that lie in the application of new methods in diverting traffic back to the carriers, the writer cites the new welded auto loading devices described in an article in the March 22, 1934, issue of *THE IRON AGE*. A substantial amount of revenue had been lost for some years by the railroads because of the trend to the driveway delivery of automobiles. An all-steel auto loader, made part of the permanent equipment of automobile freight cars points the way toward reclaiming considerable of this lost traffic for the railroads. It makes possible the shipment of four automobiles in one car. When not in use, this auto-loader folds into the roof of the car, thus not affecting the general utility for carrying grain or other commodities.

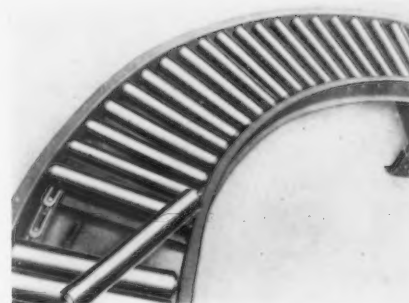
Motor Haulage Gaining

WHILE mentioning the foregoing, it may be interesting to quote from a letter received from a manufacturer of elevating and conveying machinery who was asked by the writer for a statement of any new development that had come to his attention. He wrote: "The greatest growth in a changed form of material handling during the past year or so has been the tremendously increased use of motor trucks now hauling coal from mines directly to con-

ABOVE
ONE of the four 300-ton cranes for Hoover Dam. This constituted the "prize" order for materials handling equipment taken during the past year.

AT RIGHT
THIS chain driven live roller curve is a development of 1934.

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sumers. We mention this because it is to some extent materials handling in a form that is not helpful to us, and at the present time is in a form that, in our opinion, injures more people than it helps. Yet in all probability, in some modified form, this trucking of coal from the mines to consumers is here to stay." A similar opinion relative to the diversion of auto traffic from the rail carriers was held by many; apparently, the ingenuity of a manufacturer, working in conjunction with the carriers, has solved, at least partially, this problem. It furnishes a hint of possibilities for solving the coal traffic and other problems. We are told that one of the chief reasons why the motor car industry turned to the driveway methods was the expense involved in loading and unloading automobiles in the rail movement. Again modern materials handling methods show the way.

One of the important railroad pur-

chases of materials handling equipment during 1934 was that for the new St. John's Park Station of the New York Central in New York City. Here in a new station with a capacity of 150 cars, freight handling equipment includes 14 self-leveling elevators, three of which are for the use of trucks; eight powered lift-trucks, 800 live skids, a number of low dollies and two-wheel hand trucks; also a mono-rail hoist for use in servicing lift-truck batteries; several monorail hoists for handling heavy freight and a 5-ton electric hoist operating at the southern end of the building for handling heavy pieces of freight which cannot be handled at the platform. This electric hoist will lift its load from a motor truck and carry it to the truck floor where the load is placed on a dolly for movement to a car. This St. John's Park terminal is considered an important step in improving railroad operation in that it reduces the time when railroad cars are in

other than road movement. This reduction of time at terminals is one of the goals towards which transportation experts are pointing. The use of fork trucks and pallets for handling, which has been becoming popular in many directions, has been incorporated as part of the St. John's terminal system.

Trend Toward Portability

A TREND towards greater portability of industrial machinery of certain types is indicated by several statements and illustrations in the trade press during the past year. For example, a prominent ceramic engineer, speaking before the Detroit Chapter of the American Ceramic Society, emphasized that "the industrial furnace of the future will be light in weight and more or less portable." In an article on welding in one of the recognized oil trade papers during the past month appeared a large illustration of portable X-ray equipment used for X-raying an arc-welded pressure vessel. The General Electric X-ray equipment was mounted on an electric truck, making it available at the job, instead of forcing the operators to bring the pressure vessel to the X-ray equipment. Elsewhere one learns of a floor truck which is, in effect, a portable restaurant weighing approximately 425 pounds. This particular lunchroom on wheels is made of aluminum alloy, has 27 compartments, including a coffee urn, insulated container, closed pie rack and other utility shelves, and is, as you may suspect, for use in industrial plants as a traveling cafeteria. It is understood that several large companies have already adopted this new convenience.

Harnischfeger Corp., Milwaukee, celebrated its 50th year as a builder of materials handling equipment, and as one of the accompaniments of its activities recently held a semi-public exhibit of the five Boulder Dam cranes, mentioned in this review. Four of these cranes were 300-ton units and one a 50-ton unit. The Hoover Dam powerhouse, in which they will be installed, has two bays, each 620 ft. long and the runway rails are 64 ft. span center to center. In each bay two 300-ton cranes will be installed. These four cranes are equipped with two 150-ton trolleys to each crane and each has an

auxiliary hoist of 300 tons capacity. The general specifications are as follows: *Capacity*—300 tons; lift with main hoist 70 ft., with auxiliary hoist 85 ft.; *Span*—64 ft; spread of girders 16 ft. 6 in.; main hoist equipped with 14 parts of 1½-in. rope; auxiliary hoists equipped with 10 parts of ¾-in. rope; *Speeds*—Main hoist full load 4.5 ft. per min.; auxiliary hoist with full load 23.2 ft. per min.; bridge travel 100 ft. per min.; trolley travel 20 ft. per min.; *Motors*—Two main hoist 75 hp. each; two auxiliary hoists 60 hp. each; two bridge 60 hp. each; two trolleys 10 hp. each; *Drums*—Diameter of main hoist drum 50 in.; auxiliary hoist drum 26 in.

Crawler Crane Clutch Development

AS a development of the past year, this company reports a very highly sensitized power clutch, which, it is claimed, enables users of crawler traction cranes to set machinery, erect steel and other materials with a higher degree of accuracy than was possible heretofore. This new clutch is a clam-shell equalizing shoe type of friction device. Other recent additions to the company's crane line are a high-speed lowering relay which can be applied to any d. c. motor operated electric traveling crane, this being a fully automatic device increasing the lowering speed of the empty crane hook. Further development work was continued in the line of position finders used in industrial welding departments. The adoption of modern materials handling methods constitutes a step forward in welding work.

The crane division of the Cleveland Crane & Engineering Co., Wickliffe, Ohio, brought out a new type of steel mill crane during the past year. This new crane combines a scale of the lever type which is built-in as an integral part of the trolley, and is designed to weigh all loads lifted instantly, accurately and visibly. Direct reading is obtained from the floor by means of the "Weightograph." With this new development the entire weight of the load is suspended from the scale. The crane is all welded construction.

Selective Speed Control for Cranes

OTHER improvements in overhead handling equipment have been announced by several manufac-



IN his far distant home near the Great Bear, Arcturus has heard rumors to the effect that Americans seek their "lifts" from cigarettes. Now that he visits the Earth, he finds that at least the metal-working industry does not. Lifts are needed, he finds, and many of them, for a large part of the procession of production seem to move up and down in migrations. In his Earth travels through our industry, Arcturus has noted how human ingenuity has met the problems of lifting and carrying on small scale and large. Now his Earth guide shows him this dynamic scene at the soaking pits; lifting and carrying on the heroic scale.

turers during the past year. Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y., has introduced a selective five-speed push button control for cranes and hoists. The five speeds are controlled from one button. The operator, increasing the pressure of his thumb, feels the change as each of the five independent speeds is obtained when the button is pressed or released. The first is a "creeping" speed. Each of the succeeding four speeds gives a gradual increase of torque. By releasing the button gradually, the motor is slowed down through the same graduated speeds to a stop. All five speeds are usually obtainable for lowering, regardless of the load. In hoisting, however, the percentage of rated load being lifted determines the number of speeds available. Thus full loads will not move upward until the push button is pressed to the third or fourth point. Where more than one motion is to be controlled—the movement of the crane bridge and the transverse motion of the trolley, as well as the lift of the hoist—individual push button controllers are provided for each of these operations. The controllers are built in two sizes, (CONTINUED ON PAGE 257)

United States, Purveyor of Scrap to the World

By T. W. LIPPERT
The Iron Age, New York

IN this day of quota systems, fluctuating tariffs and import preferentials, all governments are feverishly manipulating trade barriers, all to the end of extorting trade concessions from other countries. The United States is no exception. At present abortive attempts are being made to open additional markets for American goods, without, however, ignoring the multitudinous pleas of American manufacturers for protection against ruinous imports of competitive products. Consequently, it is

somewhat startling to detect murmurings of dissent regarding the wholesale exportation of scrap iron and steel (for which prompt payment is the rule).

The objections to scrap exports can be cataloged in three main divisions: first, that the scrap is being converted into war materials (for possible use against this country); second, that the basic resources of the country are being drained; and third, that American mills in the near future may be faced with a dangerous shortage of

scrap. The last two objections have some merit, but the first smacks of jingoish propaganda born of the desire of tabloids to dramatize occasional pictures in rotogravure sections.

Admittedly about 20 per cent of Japan's steel industry is engaged in the production of war or closely allied materials. But it takes considerable credulity to believe that the 1,100,000 tons of scrap bought here in 1934 by Japan has been transformed into approximately 1,600,000 tons of armaments—in other words,

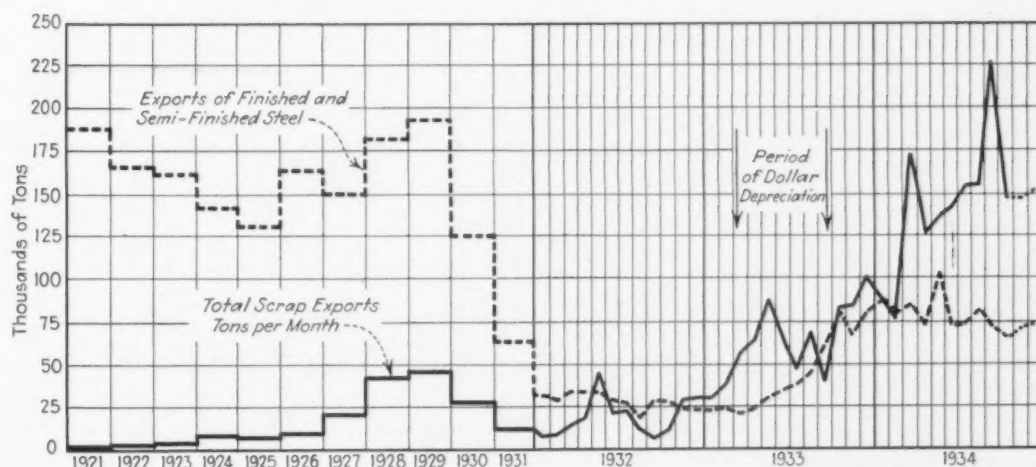


FIG. 1—The decrease in American exports of finished steel as contrasted with the rise of scrap shipments in the past decade. Dollar inflation, which began with our suspension of gold payments, early in 1933, precipitated the 1933-1934 bulge in scrap withdrawals. Prior to 1932 the average monthly exports and scrap shipments for each year are shown. Shipments for each month are indicated for the past three years.

that 45 per cent of Japan's steel industry is engaged in the production of war material. In Europe our largest scrap customers are judged to be converting some 10 to 15 per cent of American scrap purchases into direct war goods.

That most of the scrap is being made into plates, rails, reinforcing bars, etc., is undeniable. These goods may conceivably be associated with war, but to carry disapproval to this limit, is seemingly extending ethical objections to an extreme. Just as equitably could judgment be rendered against exports of American cotton, oil, non-ferrous scrap, etc.

Before examining the contention that scrap withdrawals for export are endangering domestic supplies, it should be of interest to consider the magnitude of the exports. Our best customers have been (and are) Japan, Italy, Poland and the United Kingdom in the order named. In 1934 over 1,600,000 tons of iron and steel scrap was loaded for these, and other less important, countries. This figure compares with two previous peak years, namely, 1933 and 1928, in which 781,000 tons and 515,000 tons, respectively, were exported. In 1921 only 37,000 tons of scrap went to foreign mills. The steel production, total scrap imports, and imports from the United States for the four principal buyers are listed for the years 1920 to 1934 inclusive in Table I. The real value of this table is that it contains compilations not readily accessible elsewhere. An examination will show that England, Italy and Poland are importing less scrap now than in the halcyon period 1928-1930. But the percentages of scrap imports taken from the United States are larger. Japan is unique in that her steel production, total scrap imports, and imports from here have all steadily advanced during the past decade.

The scrap purchases of Japan and Italy consist primarily of No. 1 and No. 2 steel. Brokers here usually secure Italian business through commission brokers, but Japanese business is mostly handled by the dominating firms, Mitsui & Co., Ltd., and Mitsubishi Shoji Kaisha, Ltd. England takes cast grades and stove plate in addition to steel, and brokers usually deal with the mills directly. As in the case of Italy, the Polish business

is handled through commission firms. Germany is almost constantly in the market for nickel-bearing scrap, and China's imports from this country (25,000 tons in 1934) consist mostly of soft steels. These steels, such as croppings and wire shorts, are not melted down like other country's purchases, but are fashioned into various consumer products by artisans.

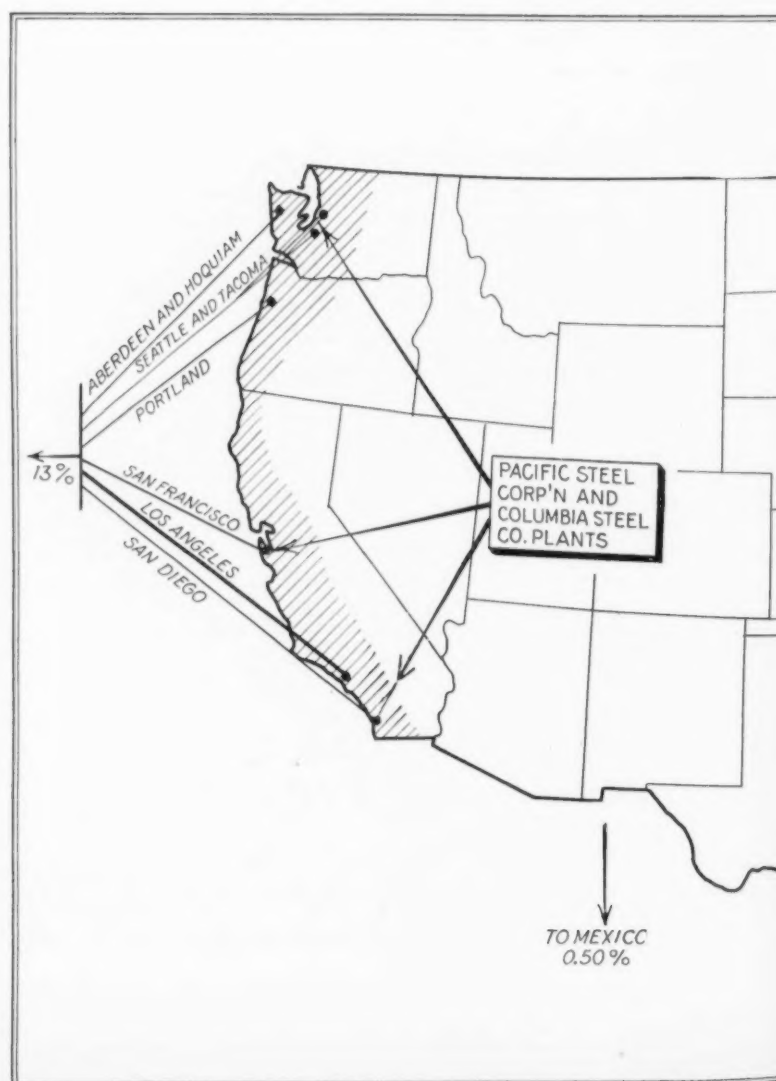
To Japan's 1,100,000 tons of semi-prepared scrap bought here in 1934 should be added a good portion of the 50 to 75 obsolete American merchant ships and scrapped warships purchased during the year. A few of these ships are moved to Japan under their own power with Nipponese crews; it is stated that those capable of renovation are being converted into naval colliers and auxiliary vessels, possibly in anticipation of the abrogation of the Washington Naval Treaty. Most of the ships, however,

are junked here for their ferrous and non-ferrous materials.

Low-Priced Scrap Available Here

As stated above, Table I shows a startling bulge in foreign deliveries of American scrap in 1934 and late in 1933. The rise is even more to be appreciated when presented graphically as in Fig. 1. What are the reasons for this sudden demand and why is the United States particularly favored? The demand largely measures industrial recovery in the countries in question, while purchases have been heavy in this country because of the plentiful supplies of scrap here at a low price level. This price level has been further reduced by dollar depreciation on foreign exchanges.

To demonstrate the favorable prices, consider the fact that scrap is currently being set down at English and Continental mills at \$12.50 to

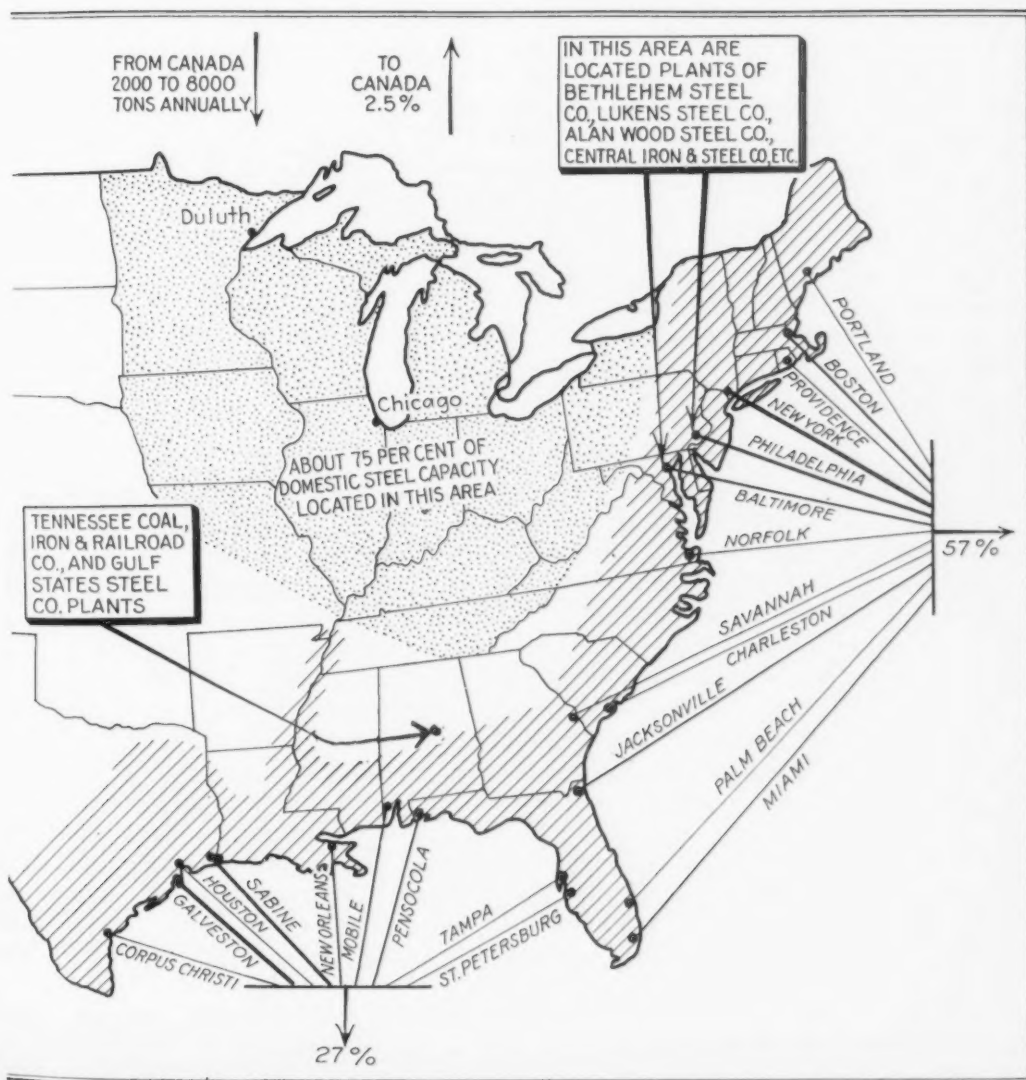


\$13 a ton. Japan is receiving steel alongside open-hearths at \$13.50 from Atlantic ports and \$11.50 to \$12 from Pacific and Gulf ports. What is of even more interest is that within the past two years Japanese mills have unloaded fairly decent grades of steel at \$8.50, Poland has unloaded steel scrap at \$7.50, and tonnages have been laid down in Italy at \$7.15. To compare with these prices, observe that basic pig iron in Japan is over \$15 a ton, and varies from \$17 a ton in the Cleveland area in England to \$25 a ton in Poland, and to a nominal quotation as high as \$30 a ton at Milan, Italy. With these spreads in prices, the desire of foreign mills for American scrap is not to be wondered at. Also it is no mystery why Italian plants will pay more than American melters for good machinery cast grades.

That scrap can be delivered at these low prices comes from a unique

combination of circumstances. The protracted period of lassitude in the domestic steel market had its natural depressive effect on scrap prices, forcing

heavy melting steel to record low levels. The usual distress lots began to accumulate and holders were begging for buyers. Added to this was



ABOVE

THIS 3000-ton lot of heavy melting steel is part of the 1,100,000 tons of scrap exported from the United States to the Orient in 1934. Total foreign scrap shipments in 1934 exceeded in tonnage and value that of finished and semi-finished steel.

• • •

AT LEFT

FIG. 2.—The areas drained of scrap for shipment abroad. A rough comparison of shipments from major ports is shown by the width of the lines.

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(and is) the right-about-face of the American dollar on foreign exchanges during 1933. Early in that year the English pound was priced at \$3.34, whereas by mid-November it was worth \$5.16. Likewise, the Italian lira jumped from 0.0512c. to 0.0906c., the Polish zloty from 11.20c. to 18.25c., and the Japanese yen from 20.75c. to 30.12c.

To better visualize this dollar inflation consider the Japanese case. In January, 1933, around 48 yen could buy a ton of steel scrap in eastern Pennsylvania, whereas in November, 1933, the same 48 yen could purchase close to 1½ tons of similar scrap at the same point. This dollar inflation is the real crux of the scrap export situation. As long as the dollar has a low value abroad, the exportation of scrap will be greatly facilitated. For that matter, the dollar was deliberately depreciated partly to expand exportation of all commodities.

To diverge somewhat, additional reasons can be given for the increasing foreign demand for scrap. If Fig. 1 is examined, it can be seen that United States exports of finished and semi-finished steels have steadily tended downward since the World War. Instead of purchasing finished steel here, many foreign countries have engaged American engineers to erect mills for them. Consequently former customers are now practically self-sufficient, and, in the case of Japan, a heavy buyer has developed into a serious competitor. Japan's imports of finished steel from this country formerly were quite sizable, but the last few years have not only witnessed a drastic reduction in imports but a concomitant expansion of exports. These exports have partly displaced American material in South America and English steels in the Far East.

However, three of the countries—Japan, Poland and Italy—are far from well supplied with proprietary iron and coal adequate to support their larger mill capacity in an economic manner. In the case of Great Britain, scrap importation is almost necessary, for by its use certain economies are possible in the instance of both pig iron and fuel which otherwise could not be attained. Add to all this the comparative recovery of Japanese business (149), Great

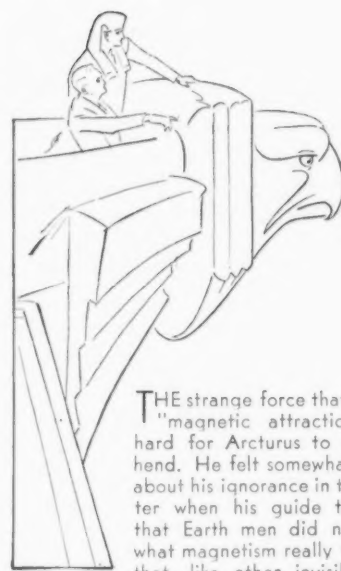
Britain (105), Italy (87) and Poland (62), as compared with the index of recovery in the United States of 69 since the inception of the world-wide depression. From this it is clear why these countries placed heavy scrap orders while American mills displayed little interest in securing supplies.

The United States is a great producer of scrap, the largest in the world. For in this country there are four times the number of automobiles in all other nations combined, the railroads are in the process of rehabilitation, and no other country has equal propensity for building and demolishing buildings, machines, and equipment. Despite this plenty, however, the exportation of 2 1/3 million tons of scrap in the past two years has exerted a noticeable influence on the statistical position and price situation of scrap in this country.

Coastal Territory Drained of Scrap

Roughly, the area drained of scrap for exports extends 100 to 200 miles inland from the principal seaports, and occasional railroad lists have come from further inland. Some of the railroad scrap has been secured at bargain levels as railroads have needed cash. The area of scrap withdrawals is pictorially illustrated in Fig. 2. Also to be noted are the occasional shipments of specialty scrap from Lake ports such as Duluth and tentatively from Chicago. Likewise of interest is the exportation of 4 tons from Arizona. In the important eastern Pennsylvania area, scrap originating in the coal regions has steadily gone to the coast for shipment, whereas formerly it was accumulated for the Pittsburgh area. The gradual extension inland for export scrap is naturally made easier because of the preferential freight rate on steel products destined for shipment abroad.

There have been (and are) scrap assemblies for Gulf shipment at Mississippi River points in Louisiana, Arkansas, Tennessee, and Mississippi, and in Texas much scrap has been drained from Dallas and Fort Worth for loading at Galveston and Sabine. The Pacific Coast has two major scrap ports, namely, San Francisco and Los Angeles. For shipment from the former port, scrap is drawn from as far north as Redding, south from Fresno, and east from Stockton. For



THE strange force that we call "magnetic attraction" was hard for Arcturus to comprehend. He felt somewhat better about his ignorance in this matter when his guide told him that Earth men did not know what magnetism really was, but that, like other invisible and somewhat mysterious mediums, we had found how to put it to work. Here he sees it harnessed on somewhat large scale, lifting heavy coils of strip steel. Later on, when he has the misfortune on his travels through our industry to get a steel splinter in his hand, he finds that magnets are useful tools in surgery as well as in industry.

the latter port, scrap is taken from as far north as Bakersfield and as far east as San Bernardino. San Diego scrap comes from the metropolitan area and as far as 100 miles down in the Imperial Valley. Seattle shipments draw from a 100-mile radius, with the lumber mills located therein as heavy contributors.

Chicago Mills Unaffected

The domestic steel and foundry capacity most affected by scrap exports is located in the fringe of territory around coastal United States. In the East, the mills of Bethlehem Steel Co., Lukens Steel Co., Alan Wood Steel Co., Central Iron & Steel Co., American Steel & Wire Co., and several other plants are affected. In the South the plants of the Tennessee Coal, Iron & Railroad Co. and Gulf States Steel Co. are in the area influenced by scrap exportations. And along the Pacific Coast the plants of the Pacific Coast Steel Corp. and Columbia Steel Co. are in the immediate territory in which scrap for Japan is purchased. The important Pittsburgh district has not been greatly influenced as yet, but when scrap buying there develops in real

volume, the mills will find that usual sources in eastern Pennsylvania have unloaded excess yard stocks to export brokers. Likewise Birmingham mills will find that sources as far away as Texas have disposed of considerable steel. The Chicago district will probably never be seriously affected as a result of foreign shipments.

Because mills in the affected areas foresee the payment of higher prices, fears have developed concerning an impending shortage of scrap. This attitude is further accentuated each month when Department of Commerce statistics disclose increasingly large shipments. That there will be an actual "shortage at any price" seems very doubtful. But that mills will have to pay higher prices for steel when buying does occur can be considered almost a certainty. This follows from the fact that much of the distress material which usually builds up in times of poor demand will have been liquidated. Therefore, domestic mills will find that the market is not one wholly for buyers when the time comes to rebuild scrap stocks. And these stocks sadly need rebuilding, for Pennsylvania mills have eaten well into reserves in order to improve their cash positions.

The 1,600,000 tons of scrap exported last year compares with about 16,000,000 tons of scrap used in the United States. In the important eastern Pennsylvania district more than 550,000 tons was shipped abroad in 1934—which represents about 3.5 per cent of the scrap used by all domestic mills during the same year. Much of the steel produced last year was melted in districts adjoining North Atlantic areas from which scrap was drawn for export. Nevertheless, the price of heavy melting steel in the Pennsylvania district throughout the year was only about \$2 a ton higher than the record lows established in 1932. And it remained \$3 to \$4 a ton lower than for periods previous to 1932.

The cry of scrap shortage has been raised often, but at no time has a good price failed to bring out supplies. Of course, occasional tightness develops, but this condition is usually an outgrowth of bulges in demand with concomitant hesitancy on the part of dealers to liquidate accumulations.

To show the possibility of a future scrap shortage, use is usually made of elaborate statistical analyses of steel

production, returns of scrapped consumer goods, etc. However, a truer picture comes from an observance of average prices. Scrap is a sensitive commodity and, if supplies over a number of years were tightening, the price would show a tendency to rise. On the contrary, scrap steel has shown a slight trend downward since the post-war slump. Even in peak years such as 1929, heavy melting steel averaged only a few cents a ton higher than in previous years of poorer output. Likewise consider the war and post-war exportation of 1½ million tons of potential scrap in the form of finished steel. In 1922 with steel production comparatively high, scrap failed to harden to any extent despite the previous withdrawal of basic material.

It is to be conceded, of course, that cheap scrap for domestic mills is not now available, and that there is a possibility that sudden heavy demands from mills might result in an apparent shortage. Much of this would come, however, from the freezing of supplies in anticipation of higher prices. But on subsequent market reactions, it is believed that good quantities would become available.

The 550,000 tons taken from the

Table I—Annual Steel Production and Scrap Imports of Principal Buyers From the United States

(Blanks Represent Insufficient Data Available)

Year	JAPAN			ITALY			ENGLAND			POLAND		
	Domestic Production of Steel Ingots and Castings, Tons	Total Iron and Steel Scrap Imports, Tons	Scrap Imports from United States, Tons	Domestic Production of Steel Ingots and Castings, Tons	Total Iron and Steel Scrap Imports, Tons	Scrap Imports from United States, Tons	Domestic Production of Steel Ingots and Castings, Tons	Total Iron and Steel Scrap Imports, Tons	Scrap Imports from United States, Tons	Domestic Production of Steel Ingots and Castings, Tons	Total Iron and Steel Scrap Imports, Tons	Scrap Imports from United States, Tons
1913	332,000	2,730	—	933,500	325,230	25,255	7,663,876	129,253	2,173	1,660,522	—	—
1920	840,500	—	4,314	773,761	142,857	1,726	9,067,300	435,701	110,978	—	—	0
1921	864,600	—	2,247	700,433	66,600	—	3,703,400	187,300	—	—	—	0
1922	938,200	—	33,123	980,719	306,041	1,685	5,880,600	104,800	—	986,800	—	0
1923	989,000	—	8,670	1,141,761	433,670	—	8,481,800	211,900	200	1,120,800	—	0
1924	1,123,800	—	6,920	1,358,853	538,459	17,051	8,201,200	459,200	1,981	679,800	—	0
1925	1,336,400	—	8,066	1,784,673	933,680	31,625	7,385,400	89,900	171	783,300	—	0
1926	1,547,900	—	18,868	1,779,518	765,222	10,751	3,596,100	40,500	2,120	788,078	—	0
1927	1,728,400	228,203	71,087	1,595,770	693,333	30,037	9,097,100	70,770	1,300	1,243,700	—	14,858
1928	1,954,400	367,207	160,427	1,959,533	861,988	70,161	8,519,700	55,400	11,300	1,436,886	820,300	63,274
1929	2,243,000	496,456	208,260	2,122,194	994,390	102,251	9,636,200	68,700	1,300	1,376,724	716,246	75,031
1930	2,326,200	488,922	168,106	1,774,094	855,378	32,755	7,325,700	215,308	494	1,237,497	676,300	5,056
1931	1,662,000	500,000	48,036	1,452,694	612,995	3,491	5,202,600	96,191	557	1,036,966	366,734	2,550
1932	2,360,000	619,600	164,001	1,391,357	474,186	515	5,261,400	116,829	303	550,754	122,980	4,350
1933	3,097,000	1,122,500	547,539	1,783,650	630,035	120,469	7,003,000	104,000	6,062	817,077	313,200	29,901
1934	3,700,000*	1,500,000*	1,100,000*	1,800,000*	370,000*	190,000*	9,646,000*	371,000*	128,000*	860,000*	350,000*	120,000*

* Estimated.

New York-Philadelphia district for export in 1934 does not represent an equivalent loss to domestic mills. Much of the scrap shipped to foreign mills would never have been collected during the long period of domestic disinterest. With distress stocks building up, a good portion of the scrap-collecting machinery ceases to function. Many of the smaller collectors turn to other livelihoods, and the material which they have collected would never have been assembled if the export outlet had not been operative.

A final consideration deals with the prospects of exportation continuing at the levels established in past months. At the time of writing, brokers are not accepting foreign commitments to any extent but, on the other hand, are endeavoring to cover short export positions on a rising market with a minimum of loss. In all probability new orders will be taken after the turn of the year—the volume of the orders depending on the willingness of foreign buyers to meet higher prices and of exporters to book the business.

The principal foreign purchasers want scrap badly and will probably meet considerably higher price levels. In fact, first quarter offer of \$11 a ton f.a.s. for No. 1 for Japan have recently been refused because of the unsettled condition of the market. But if (and when) domestic demand improves, foreign buyers are going to be forced into serious competition with American mills. Such a condition is even now operative. Lately a

good order of steel has gone from New England to Pittsburgh, whereas for many months New England has marketed exclusively abroad. However, domestic mills oddly enough are at a disadvantage in such competition because of adverse freight costs. For consider that a ton of steel can be shipped from New York to Japan (9000 miles) for \$4, whereas it costs \$5.30 to take the same ton of steel from New York to Pittsburgh (350 miles). At the time when local demand expands brokers will transfer much of their attention to the domestic market and foreign offers will have to be attractive in order to take scrap from the country.

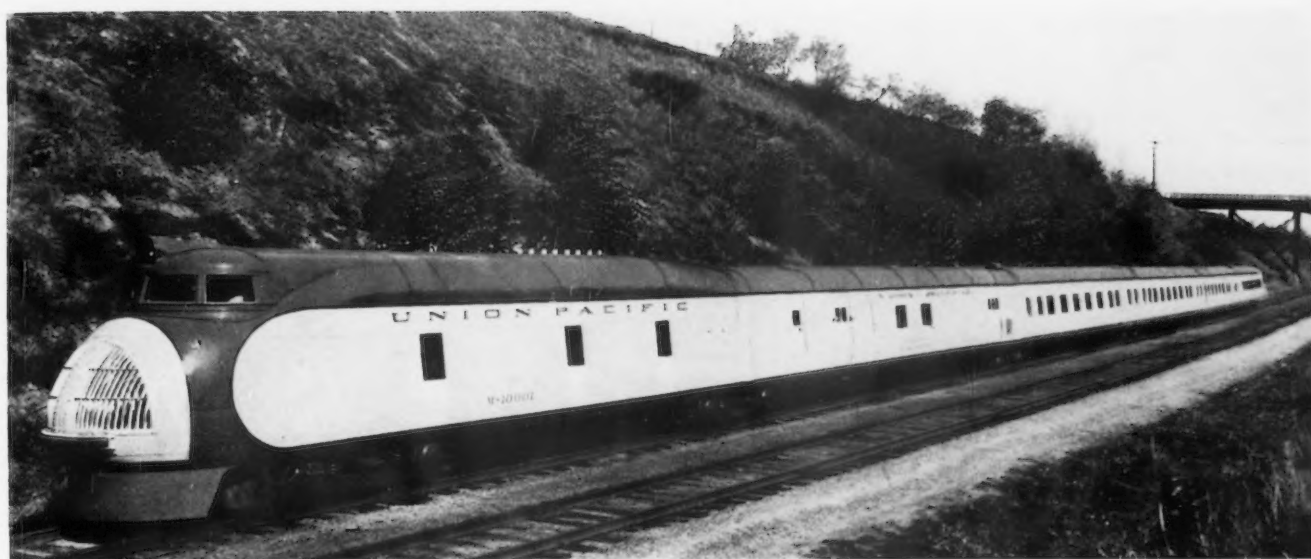
This probable attitude on the part of brokers follows from the vicissitudes of export business. Sizable losses have been taken by brokers at times when the market has risen suddenly, and thousands of tons of scrap have been exported with a net broker profit under 5c. a ton. The uncertainty in securing boats, and the long time lag between the signing of the contract and the actual loading are the major contributing factors to the danger inherent in export business.

The Japanese and Italians will both probably stay in the market as long as it is economically feasible, for both countries are almost utterly dependent on outside sources for raw materials. Japan is steadily advancing steel output and has hardly any other country but the United States to draw on for scrap. France no longer wishes to sell to Italy, and Germany will not sell due to the embargo on raw materials. Likewise,

England is no longer as regular a supplier to Poland as previously, for she needs all the scrap obtainable to supply her own wants. Considering Japan again, there is little doubt but what buyers there will meet higher prices, for in 1926 good-sized tonnages of heavy melting steel were purchased for as high as \$20 a ton delivered.

Although the present situation in this country as regards to scrap is not fundamentally serious from a shortage standpoint, there is some doubt as to the advisability of permitting scrap exportation at a high level to continue over the forthcoming years, if other conditions are such that the trade can continue. The real disadvantage lies in the fact that domestic mills in the affected areas have to pay higher prices in proportion to the amount of scrap taken from the country. Eventually such a situation will be reflected in higher finished steel prices, which, in turn, will injure both the domestic and foreign sales of American mills. That some artificial restriction on scrap exports will be necessary, however, is not likely, although certain groups are striving toward that end. The flow will probably be diminished on the appearance of somewhat higher quotations, and adverse industrial developments in the respective countries may automatically effect a reduction in the demand. Likewise buying in Japan may suffer if "soak-the-rich" plans there succeed, or international monetary developments may serve to automatically distribute part of the demand in other directions.





NEWEST of the Union Pacific System's Streamliners. This six-car flyer weighs 210 tons, is constructed almost entirely of aluminum alloys and recently achieved a speed of 120 miles per hour in a record smashing transcontinental run.

Aluminum Moved Forward in 1934

By W. S. McARDLE
Aluminum Co. of America

DEFINITE gains were recorded in several major branches of the aluminum industry during 1934, activity has been considerably greater than in the industry's recent leanest year, largely because of the amplification of already established outlets. Development of new uses for aluminum likewise contributed to the brighter picture.

In the building industry this metal continues to play a prominent part. In the new station of the Pennsylvania Railroad at Newark, N. J., aluminum applications include windows, marquees, coping decorations, grilles, entrances, and interior shop fronts, to mention only a few. The uniform, silvery appearance of the metal accentuates the beauty of the building.

On the Potomac River, near Washington, the Navy and Marine Memorial was cast entirely of aluminum. It portrays seven sea gulls hovering

over a crested wave. The gulls, as well as the wave, have been given an Alumilite finish; the predominant color is green, with high lights of gold.

A "streamlined" room has been designed with walls of aluminum sheet. The metal is Alumilited in a rich reddish brown which harmonizes

THE aluminum industry moved forward in 1934 with important developments in transportation, building and other fields. It also perfected a process permitting a new finish for aluminum, giving it a bright non-tarnishing surface. Developments of the year are covered in the comprehensive review by the author.

agreeably with the other modern furnishings of the room. The fireplace trim and torcheres are aluminum, with draperies fashioned of aluminum mesh.

In Transportation

In transportation, progress was equally well defined. Uses for aluminum in practically all types of truck bodies showed an increase while in some cases new carriers were designed to meet specific needs. Reflecting the modern trend, petroleum trucks are now produced in streamlined design and fashioned of aluminum alloys. To carry automobiles from factory to dealer, aluminum chassis-less carriers have been developed. Their bodies are rigidly constructed with stresses carried by the extruded side posts and sheet facing. Monocoque semi-trailers of chassis-less construction and built of light alloys are likewise finding application in other branches of transportation.

The versatile Alumilite finish finds another application as a finish for automotive pistons. It forms a hard, smooth oxide surface on the piston which possesses excellent wearing qualities. Wear from scuffing is greatly reduced.

A national topic for conversation has been the achievements of the Union Pacific System and its streamlined trains. A three-car and a six-car unit, both of all-aluminum construction, have been completed. The latter, carrying sleeping accommodations, recently crossed the country in the record time of 56 hr. 55 min. A speed of 120 miles per hour was achieved on one section of the run. The six-car train weighs approximately 210 tons, which is less than a third the weight of an ordinary train of similar size.

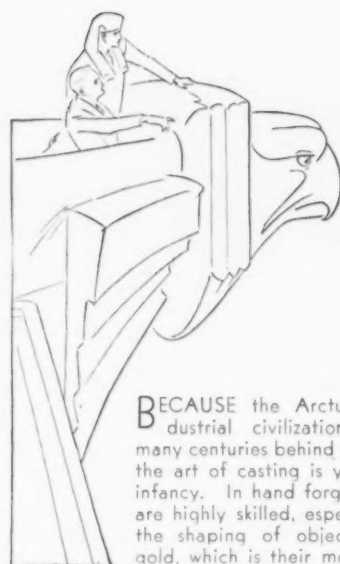
For subway and elevated service on the B. M. T. Lines in New York, a

five-section aluminum unit has been built. With half the weight, the train possesses faster acceleration and speed than the orthodox type of subway and "L" train. Running schedules have been reduced.

The Union Pacific System, within a few months, will place on the rails two nine-car trains of the same general type as their two flyers already in service. An eight-car aluminum train is being built for the Baltimore & Ohio, as well as a three-car streamlined train for the New York, New Haven & Hartford Railroad, also of aluminum.

On the Water and in the Air

As a result of the *Morro Castle* catastrophe, the marine industry is particularly interested at this time in fireproof construction of ships. It is probable that metals will play a prominent part in this development, with



BECAUSE the Arcturian industrial civilization is so many centuries behind our own, the art of casting is yet in its infancy. In hand forging they are highly skilled, especially in the shaping of objects from gold, which is their most common metal. Knowing well, however, the infinite pains and great skill that are required to even approximate a desired form or shape by hand, Arcturus cannot believe his eyes when his Earth guide shows him the process of die casting. "What supernatural speed and precision," he comments, as he sees the succession of intricate, identical and accurately dimensioned parts proceed from the press.



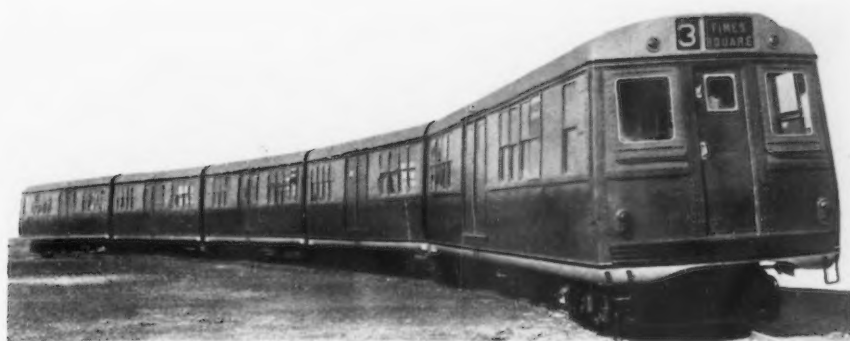
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ALUMINUM escalators in the new Marshall Field store, Chicago.

aluminum as one of the logical materials, particularly for cabin partitions and other types of bulkheads. At the Maritime Association Exposition held in New York in November, a model cabin was shown with walls fashioned of layers of aluminum sheet between which was placed cellular asbestos. This type of construction is not only fireproof but also materially reduces the weight of the wall.

Victory of the Vanderbilt yacht *Rainbow* in the recent cup races called to attention the aluminum alloy mast used on this fleet yacht. Masts made of this same metal have also been used on other racing yachts, notably the *Enterprise*, which successfully defended the cup in 1930.

Brazilian Clipper, largest of American airliners, was built during 1934 by the Sikorsky Aircraft Corp. Constructed chiefly of aluminum, the ship weighs approximately 19 tons, fully loaded. It has accommodations for 32 passengers, a crew of five and for mail and baggage. It recently completed a test flight from Miami, Fla., to Buenos Aires and return, smashing several air records en route and re-



FIVE-SECTION car designed for subway and "L" service on the B.M.T. Lines in New York. Built chiefly of aluminum, it weighs only half as much as an ordinary train of this type, possesses faster pickup and greater speed.

ducing flying time between the two cities by two days. *Brazilian Clipper* has a cruising range of more than 1200 miles and with extra tankage, carrying only mail and baggage with no passengers, its range may be extended to over 2500 miles.

Transcontinental records for commercial air travel were broken during the year when a new type of Douglas airliner made the trip from Los Angeles to New York in a few minutes over 12 hrs. A number of these super-ships have been placed in service on several important air routes in the country. Like their predecessors, they are constructed almost entirely of aluminum alloys.

Wider Scope for Alloys

Metallurgical developments included the widening scope of use for several alloys introduced during 1933, though no new aluminum alloys were brought out during the current year. An aluminum-magnesium-silicide alloy, which found its first application as an architectural metal, because of

its ease of forming and resistance to corrosion, has been selected as a structural material for marine use chiefly



THE Sikorsky airliner, *Brazilian Clipper*, which recently reduced the flying time between Buenos Aires and Miami by two days, is built chiefly of light, strong aluminum alloys.

because of its ability to stand up under salt water service.

Introduction of aluminum paste as

a pigment material for paint is of general interest to paint users in many fields. The paste is made by reducing the metal to a fine powder in the presence of mineral spirits. It dries to a smooth finish which does not collect dirt readily, and stays bright, even when exposed to industrial atmosphere. Its bright diffusing properties are superior to that of paint made with powder, which makes it well suited for use on interior surfaces. Also, it does not fly about during mixing, which is a definite advantage under certain conditions.

New Aluminum Finish

Use of the Alzak process made possible a new finish for aluminum which has many commercial possibilities. It

consists of a new type of anodic treatment which brightens the surface of the metal. The thin, protective oxide film which forms over the metal, is built up by another anodic coating process, without material loss in reflectivity. Aluminum which has been treated by the Alzak process possesses a reflectivity almost as high as that of silver and in addition is highly durable and non-tarnishing. In the case of equipment intended for use in severe atmospheric conditions, the coating is sealed by a special process making it impervious to moisture as well as to stains and weathering. It is expected that the Alzak finish will find numerous uses where there is a need for bright metal surfaces.

Aluminum continues to serve the brewers, and an ever increasing number of aluminum fermenting tanks,



THESE aluminum chassis-less type carriers are used to haul automobiles from factory to distributor. Each carrier holds three cars.



BY means of the Alzak process, aluminum is given a reflectivity approaching that of silver. The gentleman whose reflection appears in the aluminum sheet is Dr. Francis C. Frary, Director of Research, Aluminum Company of America. Seated at the right is Ralph B. Mason, of Aluminum Research Laboratories, who developed the process.

coils, brew kettles, beer barrels and other similar equipment are being placed in use. One of the principal reasons for its application in this industry is the fact that it has no effect on the color, taste, limpidity or other properties of beer. Also it is light

in weight, an aluminum beer barrel weighing about a third as much as an ordinary barrel. Likewise, equipment made of this metal is easily cleaned.

Closures made of aluminum are widely used in the liquor industry for gin, whisky and wine bottles. Among

the closures introduced during the year are the Alter-Proof seal, and the foil capsule for wine containers. The former is a rolled-on cap with a narrow metal band around the bottom. The band is slotted and when the cap is twisted, the band breaks loose and drops off. It is used chiefly for gin and whisky, combining tamper-proof features with a cap that can be reused. Aluminum foil capsules for wine use, are applied by machine and fit snugly over the stopper and neck of the bottle. A special adhesive is used, which dries to a firm bond upon application, making it impossible to remove the capsule without destroying it. They are available in a variety of colors.

Dairy developments included a variety of new evidence of aluminum's usefulness in this field. Aluminum milk storage tanks are now available up to 5000 gal. capacity, while such items as aluminum shovels for handling dried milk and rubber-covered aluminum sterilizing buckets and cast aluminum churns may also be had. Four types of aluminum foil hoods are now sold for milk bottles, two of them possessing long skirts which cover the entire finish of the bottle. One of the recent hoods has a small tear-tab to simplify removal.



The Spread of Prices Between Tin (at New York) and Tin Plate (at Pittsburgh) Remains Narrow



The Burlington "Zephyr"

A New Old Industry Looms On the Horizon

*Rejuvenation of Railroads Under Stimulus of Rolling Stock Innovations
Points to a Sweeping Rehabilitation Program*

By G. L. LACHER
Managing Editor, *The Iron Age*

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THE ingenuity, drive and resourcefulness of American industry wrought profound changes in the field of transportation in 1934. New developments on the railroads, especially in rolling stock, were of such far-reaching possibilities and, in some respects, so spectacular as to capture the interest of the entire nation.

The future of the railroads took on a brighter hue. Legislators, economists, financiers and others continued to shake their heads over the plight of the carriers and in many cases advocated remedies that pointed to ultimate nationalization, but in the meantime industrial ingenuity was at work creating new means for recapturing lost traffic and reducing operating costs. Railroad executives, who had

been driven to despair because of an apparently inextricable dilemma in which they were barred from reductions in taxes and labor costs, saddled with an inflexible rate system and confronted with increasingly severe competition from other forms of transportation, took new heart. In both the passenger and freight fields they caught a vision of a return of profitable operations.

New design and new materials have both played a part in recent developments in railroad rolling stock. Two passenger trains, completed early in the year, were of

revolutionary streamline design and were constructed of light materials, one of stainless steel and the other of aluminum alloy. They were widely exhibited and both established new speed records on test runs. Follow-up orders were placed for both types of trains.

In addition, passenger trains were constructed of less extreme design, representing less of a departure from the dimensions and design of conventional coaches. In all cases, however, a marked reduction in dead weight without sacrifice of strength was attained. The Chicago, Milwaukee, St. Paul & Pacific, using ordinary carbon steel for the construction of 52 coaches, achieved a weight saving of 35 per cent through the use of welding. Ordinarily the weight problem is

attacked by employing light materials. Besides stainless steel and aluminum alloy, Cor-Ten and Man-Ten, low-alloy high-tensile steels developed by the United States Steel Corp., have been specified in a number of passenger car orders.

The Baltimore & Ohio is having the American Car & Foundry Co. construct two streamlined passenger trains, of which one is being built of Cor-Ten and Man-Ten and the other of aluminum in the superstructure and Cor-Ten in the underframe. The same equipment manufacturer is building two streamlined passenger trains for the Gulf, Mobile & Northern. The Standard Steel Car Co., subsidiary of the Pullman Car & Mfg. Corp., has completed a number of passenger coaches built of Cor-Ten and Man-Ten for the New York, New Haven & Hartford, which has ordered a total of 50. The Standard company is likewise constructing 10 passenger coaches and 21 suburban cars for the Boston & Maine of the same materials.

The motive power of the Burlington and Union Pacific streamline trains is supplied by Diesel internal combustion engines. Separate locomotives of the Diesel type have been bought by a number of roads. High-tensile steel, fabricated by welding, is being used for the frames, crankcases and other structural parts of Diesel engines for railroad service.

Taking the Dead Weight Out of Freight Cars

The low-alloy, high-tensile steels have also been employed to reduce the weight of freight equipment. Two experimental hopper cars and one box car were built of Cor-Ten by the Baltimore & Ohio Railroad and a sample hopper car of Cor-Ten was recently completed by the Pressed Steel Car Co. The Mount Vernon Car Mfg. Co. is building a 50-ton box car of Cor-Ten and has constructed an experimental 40-ton refrigerator car, with dry-ice temperature control, in which about half of the steel used is Man-Ten.

Through the use of light materials the ratio of pay load to gross load in freight cars has been raised from 72-75 per cent to over 80 per cent. Various estimates have been made covering the savings achieved through weight reduction and, while these

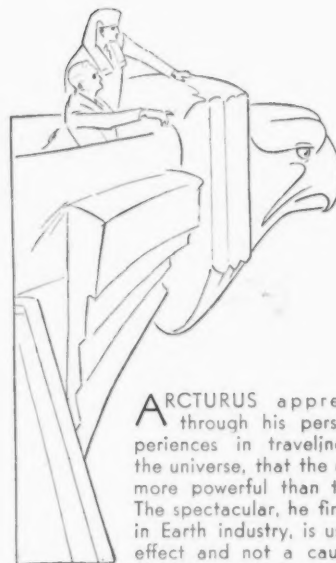
have not yet been borne out by experience, they have aroused the interest of the whole railroad world. In cutting down dead weight and increasing pay load the carriers see their best hope of converting deficits into earnings. The Pressed Steel Car Co. makes the interesting comment that if the 2,000,000 freight cars of the United States had been of the new light-weight type in our worst depression year—1932, the economies not only would have covered the deficit after fixed charges, which amounted to \$139,000,000, but would have yielded \$300,000,000 for dividends besides.

On Threshold of Equipment Boom?

Experience alone will demonstrate just how large the savings from the new-type equipment will be, but at least all immediately concerned—railroads, car builders and purveyors of materials—are convinced that they are on the threshold of one of our most active periods in rolling stock construction. Some 600,000 American freight cars are equipped with arch-bar trucks which cannot be offered in interchange after Jan. 1, 1936. More than 60 per cent of these cars are over 20 years old and, with the markedly improved new equipment now available, it is likely that they will be scrapped rather than rebuilt.

What has happened in the past year is, of course, just a beginning. All suppliers of materials are hard at work developing products that will compete for the favor of equipment builder and railroad. Aluminum alloy has been in the field for several years as a material for freight equipment construction, and a list of cars constructed of that material was published in *THE IRON AGE* of Aug. 2, 1934. The Republic Steel Corp. has recently introduced R-D-S (Republic double-strength steel) which is being offered as a railroad equipment material.

The conversion of 600,000 freight cars into light-weight equipment would create the greatest burst of activity in the rolling stock field since all-steel cars entered the field to replace wooden cars. Besides giving the durable goods industry a major stimulus, the expenditures involved, in sharp contrast with many huge outlays made in late years under Governmental auspices, would be self-liquidating. In a word, capital investment would be economic as it



ARCTURUS appreciates, through his personal experiences in traveling about the universe, that the unseen is more powerful than the seen. The spectacular, he finds, even in Earth industry, is usually an effect and not a cause. The electric motor, he observes, is an effect of the cause of invisible electrical power. Molten metal is the visible effect of invisible heat. Going a step further in this philosophy, the Earth guide tells Arcturus of the vital importance of the invisible heat control which is now so important in making steel as well as in other metallurgical operations. And to illustrate this thought he takes him also into the pyrometer room where the guardians of temperature control exercise their uncanny vigil.

always should be, reducing costs and yielding earnings.

Rejuvenating an Old Industry

The lift that would be given to the operations of steel mills and makers of other materials and equipment would go far toward the elimination of the country's unemployment problem. In short, the re-equipment of the railroads, not alone with new-type freight cars but also with improved passenger trains and better motive power, would have much the same influence on our economy as the spectacular rise of the adolescent automobile industry had in the '20s. If the country needs a new major industry to pull it out of the rut, a rejuvenated old industry may do just as well.

The financing of new equipment presents a difficult problem. Many roads are not yet in a sufficiently strong position to buy, and they are reluctant, in some cases, to ask for additional Government loans. The advantages to be gained from improved equipment, however, are such

that aversion to Federal entanglements will probably not prove a decisive obstacle to rolling stock programs. Moreover, a moderate improvement in railroad earnings, such as seems to be in prospect for the early months of this year, may ease the way to equipment purchases.

A New Stimulus to Grade Separation Programs

The ramifications of equipment rehabilitation are wide. Increasing adoption of high-speed streamline passenger trains will focus attention on grade crossings. According to V. G. Iden of the American Institute of Steel Construction, this country has 210,000 unprotected crossings, which naturally place limits on the speed at which trains can be safely operated. The work of eliminating grade crossings, especially where they are a menace to rapid transit, will provide another major stimulus to the durable goods industry. The elimination of all crossings, it is estimated, would cost \$2,400,000,000, but even if this outlay were reduced to \$1,400,000,000, it would provide a year's work for 750,000 men directly engaged on the highways and in the construction of the overpasses, besides furnishing employment for many thousands more

Miscellaneous Applications of High-Tensile Steels in Transportation Field

One Cor-Ten and Man-Ten Diesel-electric locomotive.
Man-Ten brake beam rods.
Cor-Ten truck tanks.
Man-Ten containers.
Twenty-five Cor-Ten mine cars.
Cor-Ten welding rod.
Cor-Ten side sheets for 12 subway cars.
Cor-Ten rivets.
Cor-Ten roof and hopper door sheets for 100 phosphate cars.
Man-Ten trucks.
Cor-Ten car ends.
Cor-Ten trucks for high-speed trains.
Cor-Ten car doors.
Two single car Cor-Ten rail buses.

in mill and factory, and indirectly on the farm.

A corollary of the new developments in freight car design is the progress being made in devising steel containers for the economical transfer of merchandise shipments from highway truck to railroad vehicle. These containers are now in use in restricted areas and, if adopted for universal interchange, will open up another important tonnage outlet for rolled steel.

Mill developments in connection with material for freight equipment

have not been limited to the perfection of new alloys. For freight car requirements, material of larger dimensions is now being rolled. Last spring the Pennsylvania Railroad bought from the American Sheet & Tin Plate Co. car roofing sheets that measured 256 in. long by 31 13/32 in. wide by 3/32 in. thick. These sheets are believed to be the largest ever rolled by the company. Later the Pennsylvania ordered sheets that ran 130 in. long, 86 in. wide and 1/8 in. thick. Both of these lots were rolled at Gary.

To meet specifications for the entire length and width of a conventional freight car roof, a sheet would have to measure more than 30 ft. in length and more than 8 ft. in width. There are only a few mills in the country that might come near meeting these specifications and they are plate mills. Moreover, the rolling of extra long and wide sheets on a plate mill brings up the question of cold reducing to get the sheets down to the usual light gage required by the railroads. It is still problematical whether this method of producing sheets for car roofing would be economical.

It has been suggested that two 30
(CONCLUDED ON PAGE 279)

Light-Weight Railroad Equipment Completed or Ordered in 1934

Passenger Equipment

Stainless Steel

Chicago, Burlington & Quincy, one three-car train, the "Zephyr," completed and a fourth car on order. Two additional "Zephyr"-type three-car trains under construction.

Texas & Pacific, one two-car train completed.

Boston & Maine, one three-car train under construction.

Special Steel

Baltimore & Ohio, one eight-car Cor-Ten and Man-Ten steel train on order.

Gulf, Mobile & Northern, two three-car Cor-Ten steel trains and one extra Cor-Ten streamlined coach on order.

Illinois Central, one five-car Cor-Ten steel train on order.

New York, New Haven & Hartford, 50 Cor-Ten and Man-Ten through passenger coaches, in course of completion.

Boston & Maine, 10 deluxe through passenger coaches and 21 suburban coaches, being built of Cor-Ten and Man-Ten steels.

Carbon Steel

Chicago, Milwaukee, St. Paul & Pacific, 52 welded steel coaches completed.

Aluminum

Union Pacific, one six-car and one three-car trains completed and two nine-car trains ordered.

Baltimore & Ohio, one eight-car train being built.

New York, New Haven & Hartford, one three-car train under construction.

Freight Cars

Dow Chemical Co., two aluminum tank cars completed.

Other chemical companies, 10 aluminum tank cars completed.

Baltimore & Ohio, one aluminum alloy hopper car completed.

Baltimore & Ohio, two Cor-Ten and Man-Ten steel hopper cars completed.

Baltimore & Ohio, one Cor-Ten and Man-Ten steel box car completed.

Mount Vernon Car & Mfg. Co., one Cor-Ten steel 50-ton box car, under construction.

Mount Vernon Car & Mfg. Co., one 40-ton refrigerator car, one-half of material Man-Ten steel, completed.

Pressed Steel Car Co., one Cor-Ten steel hopper car, completed.

Bessemer & Lake Erie, 100 Cor-Ten steel 50-ton hopper cars, on order.

Electric Railway Equipment

New York Rapid Transit Corp., New York, five-section articulated subway-elevated car, built of stainless steel.

New York Rapid Transit Corp., New York, five-section articulated subway-elevated car, built of aluminum alloy.

Chicago Surface Lines, one aluminum-alloy street car completed.

Electric Railway Presidents' Conference Committee, one Cor-Ten Model B Hirshfeld street car built.

Capital Transit Co., District of Columbia, 20 Cor-Ten street cars of modified Hirshfeld design on order.

Board of Transportation, New York, 300 subway cars constructed partly of Man-Ten (1931-32). This is believed to have been the first use of high-tensile steel in railroad equipment.



□ □ Substantial

THE past year has seen substantial technical progress in all branches of welding and cutting. In arc welding, use of the alternating current process has increased, particularly in the heavy current field of pressure vessel welding, and a variety of new equipment, including an automatic welding head, with suitable heavily-coated electrodes, has been made available. Development of d.c. arc welders included interesting remote control devices which, in making it possible for the operator to regulate the current accurately without making trips to and from the machine, serve to increase output and assure higher quality of weld. Heavily-coated electrodes that develop weld strength ranging from 85,000 to 100,000 lb. per sq. in. were offered, as well as electrodes that may be used for vertical and overhead as well as for flat welding and thus may be used on large structures the moving of which into a special position is impracticable or impossible.

Announcements of new or improved resistance welding machines were unusually numerous, and embraced all types. They included a combination welder and flash stripper for joining strip steel into continuous lengths; a machine for welding sheets into the larger sizes required for streamlined auto bodies; and a highly developed automobile panel welder which weighs 40 tons and makes two

weld lines 85 in. long at the rate of 45 to 60 an hour. Development of a "hydromatic" welder for use in the manufacture of automobile body and other sheet steel parts was also announced. A portable spot welder with pneumatically-operated gun; spot and seam welders for joining heat-treated aluminum alloys; and a new line of seam welders adaptable to welding of corrosion-resistant steels and non-ferrous metals were other machines.

A blowpipe or torch having a multi-flame welding head that increases speed of welding and reduces cost of rods and gases was an outstanding

development in oxy-acetylene welding equipment. Improved flame cutting machines ranged from small units, motor-propelled and hand-guided, to a large pantagraph type machine of increased cutting range. Rugged and accurate construction and facility of control approaching machine tool standards now feature machines of this class.

Portable tensile and bend weld-testing machines, X-raying equipment, portable weld stress relievers for pipe were also made available, as well as goggles and welding helmets of improved design.

A.C. Arc Process Furthered by New Electrodes

MORE extensive use of alternating current arc welding is attributed largely to the development of suitable heavily-coated electrodes. An outstanding advantage of the a.c. process is the absence of magnetic blow, resulting in uniformly high quality of weld, this advantage being said to become particularly apparent with welding currents above 250 amp.

Four or more prominent companies introduced new a.c. welding equipment during the past year. One of them offered a complete line, including transformer units, electrodes and automatic welding heads and control. Three sizes of transformers, having

1-hr. ratings of 500, 750 and 1000 amp. respectively, are built. They are of high reactance types, and are air cooled. Attachments are available for reducing the secondary open circuit voltage. Provision is also made for varying the reactance so that the full welding range of the equipment can be obtained on any one of three secondary open circuit voltage settings.

A single-operator transformer type a.c. welder rated at 750 amp., 40 volts, complete with control, was offered by another company for either hand welding or continuous service such as generally encountered with

Developments in All Types of Welding

By R. E. MILLER

automatic welding. A unique control feature reduces automatically the open circuit secondary voltage when not welding, thus permitting, it is stated, the most desirable arc striking characteristics. The same company introduced a small a.c. unit for arc welding light-gage materials, including stainless and other alloy steels.

Motor-Generator Type A.C. Welder

The "shield arc" a.c. welder of a third company is of motor-generator type. It takes two and three phase current of standard voltages and frequencies and converts into a.c. of lower voltage and at a higher frequency suitable for arc welding with either heavily coated or washed electrodes in all positions. Advantages claimed include improved arc characteristics due to the higher frequency; also improved weld metal because of lessened spatter loss and, in multiple-pass welding, greater density. Better power characteristics from the line are also claimed.

For arc welding thin sheets, plates and shapes, the same company developed a small motor generator unit that can be used on any a.c. power line, including 110 volt circuits. It delivers as low as 20 amp. at the arc without the use of auxiliary devices. As electrodes as small as 1/16 in. can be used, the welder is applicable to materials as light as No. 24 gage.

Portable equipment for welding

studs to steel surfaces for hanging piping, hooks, instruments, signs, etc., was brought out. It consists of a portable steel cabinet containing a transformer and control, primary and secondary cable, and a stud-welding gun. In operation, a stud is placed in the welding gun and pressed against the surface to which it is to be welded; one automatically timed impulse of the power then completes the weld.

Arc Welder Close-Coupled to Gas Engine

Increase in capacity by some 60 per cent, as compared with a previous model, features a new 300-amp. 40-volt gas-engine driven d.c. shield arc welder. Close coupling of engine and generator also results in greater compactness and lighter weight. Other features include dual control of welding heat and sparkless commutation. A special idling device reduces engine speed when the arc is broken. Remote control that permits the operator to adjust current supply merely by tapping the electrode on the work can be furnished.

New portable single-operator arc welding sets incorporating a number of refinements were brought out by another company. Having no external reactor, resistor or separate exciter, these welders are self-contained.

In automatic arc welding equipment, a head and control of simplified design as compared with a previous

model was introduced. The electrode is fed by a small motor through worm reducer and a three-speed transmission. A dial on the gear case facilitates selection of speed, and means are provided for quick and accurate control of electrode feed. As the nozzle may be swung by means of hand-wheels in two planes at right angles to each other, the electrode can be positioned accurately with respect to the work. The motor, which is vertically mounted on top of the gear case, has adequate power not only to feed the electrode but to straighten it as it comes off the reel. Electric control equipment consists of an inclosed panel equipped with standard relays and contactors to maintain in proper sequence the operations necessary in starting, turning and stopping the welding head. An instrument panel carries meters showing arc voltage and current, start-stop buttons and other controls.

Equipment for Building Up Rail Ends

For building up rail ends, repairing cross-over castings and similar work, a method employing a new type of welding rod and flux and said to involve a new application of the arc was announced. With the electrodes mounted in a suitable holder and inclined at the proper angle, the flame is projected past the positive electrode. This results in a "soft" flame without high pressure back of

it, and consequently has no tendency to blow the metal. The positive electrode is of channel shape with a small core running through it, while the negative is cylindrical with one end tapered to a fairly sharp point. The rail end to be surfaced is first heated by the arc flame and when sufficiently hot, flux is applied. The work is then further heated until a glazed surface appears. Without removing the flame, a rod is inserted and held there until it is ready to melt, when it is lowered to contact with the piece to be surfaced. Bonding action is rapid, and when the rail has been surfaced, no subsequent treatment or peening is required.

Remote Control Economizes Time

Two remote control devices were interesting additions to arc welding

equipment of the past year. One of them is arranged so that by tapping the electrode on the work several times, the voltage is raised automatically; a greater number of taps and the voltage is lowered. Thus, merely by tapping the electrode, making and breaking the current, the current output of the generator is controlled. The device does not involve use of additional cables or a rheostat. Its mechanism is incased in a small box which may be attached to the welder voltage control.

Used with the company's arc welding equipment, another remote control device provides 140 steps, making possible 400 combinations of open circuit voltage and welding current. Dial calibration is provided for relocating settings already determined as best for certain jobs.

New Electrodes Meet Wide Variety of Requirements

A NUMBER of new arc welding electrodes, for the most part of heavily-coated type, were made available during the year. One, for high-speed welding in the flat position, either manual or automatic, is said to produce equally good results on either direct or alternating current. Economy is attributed to ability to operate at higher speeds, in larger diameters and at higher current values than usual. These electrodes are for Class 1 boiler code welding.

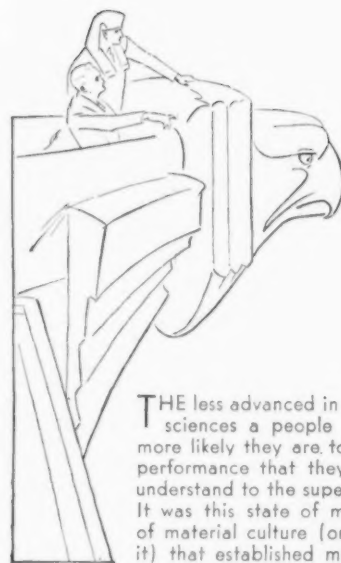
The same company introduced a new general-purpose electrode that may be used in any position, for flat, vertical or overhead welding. It has deep penetrating properties and is equally suitable, therefore, for butt and fillet welds. It is said to produce welds of the quality required by the boiler code for Class 1 vessels, and has a wide field of application in the fabrication of large structures, the moving of which into a special position is impracticable or impossible.

High Tensile Strength Welds

For arc welding steels containing more than 0.20 per cent carbon, another company brought out an im-

proved heavily-coated electrode. This is said to hinder the migration of carbon from the parent metal to the deposited metal, assuring a more ductile deposit. Tensile strength of deposits is 73,000 lb. per sq. in., yield point, 59,000 lb. and elongation, 31 per cent in 2 in. Other electrodes offered by the company, for use with high-strength steels, are said to make possible welds with tensile strength ranging from 85,000 to 100,000 lb. per sq. in. The high strengths are obtained by including nickel or molybdenum, or a combination of these, in the deposited metal. One of these new electrodes, depositing 2½ per cent nickel, is used for welding steels of the same analysis for low temperature work where the welds must show Charpy impact resistance of 10 to 24 ft. lb. at a temperature of -75 deg. F. Tensile strength of this weld metal averages 86,000 lb. per sq. in., and elongation, 25.5 per cent in 2 in.

High tensile strength—85,000 to 100,000 lb. per sq. in.—is also obtainable with a new heavily-coated electrode made by another company. This electrode is said to be particularly suitable for welding those low-alloy



THE less advanced in arts and sciences a people are, the more likely they are to impute performance that they cannot understand to the supernatural. It was this state of mind and of material culture (or lack of it) that established mythology with its horde of gods and goddesses. Small wonder then, when Arcturus notes the effects of mechanical power transmission, that he looks for the *deus ex machina*. Like most of the gods of mythology, the great power that makes industry's wheels go round is invisible. But Arcturus, through some unearthly second sight, catches a glimpse of him.

structural steels which, on normalizing, have tensile strengths under 100,000 lb. per sq. in. It is suitable for flat, vertical and overhead welding.

For Welding Where Fit-Up Is Poor

A general-purpose heavily coated electrode for high-speed single pass arc welding was also brought out. Its arc characteristics are said to adapt it for use where the fit-up is apt to be poor. Rapid welding at low cost is attributed to high burn-off rate and low spatter loss. Tests of weld metal specimens show tensile strength of 70,000 to 80,000 lb. per sq. in.

For cast iron welding by the shielded arc process, a ⅛-in. electrode having a steel core surrounded by a heavy flux coating has been developed. A feature is the low heat with which it can be used, thus reducing the possibility of cracking. The electrode is used with about 80 amp. of current, and the welding is done intermittently, not over a 3 in. bead being laid at one time.

The company has also produced a shielded arc electrode for building up worn surfaces of steels of all types, except austenitic. This electrode is

said to deposit an air-hardening alloy steel of unusual hardness and toughness, a single layer on mild steel

having a Rockwell C hardness of 40 to 45 and additional layers, a hardness of 48 to 52.

Electric Resistance Welders Highly Developed

ELECTRIC resistance welding machines were well represented in new equipment announcements of the past year. They were of all types and ranged in size from a portable unit employing a small, air-operated spot welding gun to a gigantic automobile panel welder weighing 40 tons. Several of them incorporate distinctive features.

A heavy-duty combination welder and flash stripper was developed for joining strip steel into continuous lengths as it comes from the mill rolls. The flash that results from the welding is stripped automatically by a unit mounted on the bed of the machine, the stripping being accomplished by tools carried on a ram that reciprocates across the welded joint. The entire cycle of operations, including clamping, is completed in 20 seconds. Capacity is for strip steel up to 0.212 in. thick and from 3 $\frac{3}{8}$ to 8 in. wide. The transformer has a continuous rating of 100 kva. Voltage regulation in eight equal steps is provided.

The same company built an overhung rim welder featuring operating conveniences and unusually rugged construction. Capacity is for material up to 10 in. wide, 3/16 in. thick and rims of 15 in. minimum diameter. Hourly production ranges from 250 to 600 rims. Main electrodes or die supports are projected forward from the face of the transformer so that the rims may be slipped directly over them and hung down in front of the machine. The movable electrode is carried by a swinging arm and is hinged on a hardened steel pin designed with an eccentric. Rotation of the arm gives vertical adjustment of $\frac{1}{4}$ in., which permits the operator to bring the movable and stationary dies to an exact height and eliminates the necessity for shimming the dies. The machine is equipped with a 750-kva. transformer, and a separate auto coil permits varying the voltage in eight equal steps. It weighs 32,000 lb.

A special flash-welding machine has

been designed to produce wide sheets used in making streamline bodies for automobiles. Soft, clean welds are accomplished through making a slow weld, and also an upsetting arrangement that is different from that of the usual flash welder. After welding, a separate flash trimming machine is used to remove the flash from both sides of the sheets.

Use of "hydromatic" welding machines in the production of all-steel passenger car bodies for a popular automobile was announced. The machines are made up of a number of small hydroelectric welding guns which are mounted horizontally, vertically or at an angle in welding fixtures and connected to a common bus bar and to a common source of oil pressure. A control mechanism automatically operates the welding guns in rapid succession. In welding panels, the operator first places the work in the fixture and opens the main hydraulic valve. The welding then proceeds automatically, the guns operating at a speed ranging from two to five welds per second. Welds may vary in number from 50 to 200, and when completed, the fixture opens automatically. In welding reinforcement strips to front fenders, with a total of 70 spots, 124 fenders are welded an hour. In welding a cowl, the nine parts are placed in jigs in less than one minute and are welded in 45 seconds. It is stated that as only one weld is made at a time, a comparatively small transformer may be used. For large jobs several groups of welding guns may be mounted on the same fixture, each group having its own transformer and hydraulic control unit. Automatic timing adjustment is provided.

Machine for Heavy Projection Work

A new portable spot welder is equipped with a 33 kva. transformer arranged for suspension from a mono-rail or for mounting on rollers for floor use. Water-cooled copper leads of suitable length connect the trans-

former to a pneumatically-operated welding gun. The transformer is housed in an aluminum case having as an integral part a nine-step current regulator. Capacity is for welding two thicknesses of No. 18 gage, clean stock.

In projection welders, a new hydraulically-operated unit of vertical tie-rod construction permits application of 30,000 lb. pressure. The transformer has a rating of 600 kva., and eight equal steps of heat regulation are obtainable. Current timing is accomplished accurately by means of a Reese synchronic switch which mechanically opens and closes the contactor. The welding head is actuated hydraulically and its stroke may be varied from $\frac{1}{2}$ to 6 in.

A two-head double-stroke projection welding press arranged to weld two gusset plates to the top rail and back panel of automobile bodies was also developed. The machine makes 16 welds at each stroke, or 32 welds with each revolution of the head. The installation features minimum handling of the work, and lowered unit cost.

Seam Welders Have Wide Range

Spot and seam welders for heat-treated aluminum alloys was an interesting development of another company. The seam welder features twin transformer construction that gives uniform distribution of power with minimum reactance and resistance losses. The lower roll is driven, eliminating all unnecessary weight from the upper roll. Operated by a cushioned air cylinder, the upper roll-carrying arm has very smooth action, and the roll pressure is adjusted and maintained uniformly through a pressure reducing valve. These features are emphasized particularly because even a slight hammering effect when the rolls contact the work tends to bed the rolls into the alloy, which adversely affects the welding. Welding speeds ranging from 40 to 240 in. per min. are obtainable.

Universal, air-operated seam welders featuring wide operating range and increased flexibility were also brought out by the company. Welding rolls can be tilted either to right or left of the knee to permit cross as well as longitudinal welding. Welding speeds ranging from 45 to 130 in.

per min. are obtained through a variable-speed motor, which drives the upper roll through a gear reducer and spiral gears. A 100-kva. pancake-type transformer is employed, and a 16-step regulator gives close adjustment of welding heats.

Mass Production Seam Welder

New machines for mass-production straight or circular seam welding of ferrous metals, including corrosion-resistant steels, and, with slight modifications, non-ferrous metals, were made available by another builder. Means are provided for constant welding speed regardless of welding wheel wear, and also for maintaining constant welding pressure. A highly efficient cooling system is another feature. The machine has a considerable range of application, handling pieces from 10½ in. in diameter

and 12 in. in length up to 40 in. in diameter and 45 in. in length. Welding speeds are from two to 15 ft. per min. and welding pressure from 650 to 1400 lb. Transformers of 100 to 250-kva. capacity can be furnished.

The same company developed an interesting dual roll seam welder for assembling the back panels of refrigerator cabinets to the sides and front, which are made from a single sheet of metal. Both sides are welded at the same time as the refrigerator shell passes through the machine on a traveling platen, which is of copper and acts as a current conductor between the transformer and the welding rolls. Its forward and return motion is controlled by a reversing switch and rack and pinion drive. Various widths of cabinets can be accommodated by providing suitable platens.

applied to the fabrication of parts made from flat material.

The same company brought out a general-purpose cutting blowpipe or torch designed to cut at lower oxygen pressures than its previous models. On 10-in. stock the pressure is 75 lb. and on 6-in., 45 lb.

Flame Cutting Equipment Built to Machine Tool Standards

Flame cutting machines to meet a wide range of requirements as to type, size and thickness of work are now available. They include manual and motor-driven units and portable and stationary models, either semi- or full-automatic. Machines carrying as many as six torches, centrally controlled and guided, cut up to six identical shapes simultaneously. The jig-saw flexibility of these machines permits flame cutting of irregular shapes as easily as straight edge or circular pieces. Accuracy as to squareness and longitudinal alignment of the cut surface is of the order of a few thousandths of an inch for material up to 2 in., with proportional tolerances for material ranging in thickness up to 26 in.

The process has so grown in the past decade that there are now many subdivisions under both flame cutting, which severs by linear oxidation, and flame machining, a later development, which removes material from the surface of the metal. The latter, which classifies with rough machining, with tolerances held to 1/16 in. in some operations, includes deseaming of billets, slabs and rounds in steel mills, and exploring and cleaning out cracks and sand holes in steel castings. Another application is in hogging, or removal of superfluous metal in steel castings, such as risers and sprues, the location of which makes it difficult or impossible to remove by ordinary flame cutting. Applications of flame "milling" include profile milling of edges of plates and back milling of partially welded U-type butt joints. Cutting of concave types of fillets along the edges of rolled plates or bars is a development of flame milling believed to have possibilities. Accurate punching of holes is considered within the scope of flame drilling and boring, and flame drilling has been used successfully for rivet cutting by surface oxidation of heads. The oxygen lance

(CONCLUDED ON PAGE 280)

Multi-Flame Head Developed for Gas Welding Torch

OXY-ACETYLENE welding and cutting apparatus introduced during 1934 included multiple-flame welding equipment offering increased speed with less welding rod and gases in overland pipe line welding. In flame cutting machines several highly developed units built to machine tool standards as regards accuracy of construction and convenience of control were added to existing lines.

The multi-flame welding head is designed to use an excess acetylene rather than a neutral flame, backhand technique, special flame adjustment and a special steel welding rod. The tip is arranged to give three flames, namely a main welding and two smaller auxiliary flames, the latter positioned so as to preheat both edges of the vee ahead of the point of welding.

Use of excess acetylene flame carburizes the base metal surfaces just ahead of the advancing puddle, so that this surface metal, though not melting, reaches a white-hot temperature and absorbs carbon from the excess acetylene flame. This lowers the melting point of the surface metal, so that the latter is readily melted, assuring proper melting of the base and weld metals, without deep melt-

ing of the base metal. The carbon absorbed in the surface metal also reduces ordinary surface oxide to the form that unites with the puddle. Furthermore, the welding rod provides deoxidizing agents which cleanse the puddle and prevent oxidation of the carbon.

Savings in Rods and Gases

Included angle of pipe end bevel in this process is from 60 to 70 deg., instead of the usual 90 deg., and this, together with the less spacing permissible between the section ends, contributes to savings in materials and in welding time. With the backhand technique, less motion of both blowpipe and rod is necessary and the operator is able to observe at all times the sides and bottom of the vee in advance of the puddle. Because of the simplified technique, welders may be trained more easily. It is stated that in laying several hundred miles of pipe of various diameters, the increase in speed of welding as compared with the company's single-flame equipment is 33 1/3 per cent or better. The savings in rods and gases are in excess of 25 per cent. Although in the beginning the multi-flame method was more or less restricted to rotation welding, it has since been



External Broaching Outstanding in Year's Machine Shop Developments

By R. E. MILLER

Machinery Editor, The Iron Age

NEW external or surface broaching equipment, including a broaching lathe for cylindrical surfaces, was, with greatly increased use of this machining process, an outstanding development of the year in the machine shop field. Highly developed machine tools of other classes were also made available, however, and in some cases, as for example an internal grinder of centerless type, the developments were of an epochal nature.

Design and construction that will permit use of cemented-carbide as well as of other cutting tools to their utmost is a continuing trend. In this, increased power, heavier and more rigid construction, use of better materials, wider ranges of speeds and feeds, simplified and centralized control, and facilities to reduce set-up and work handling time have been provided. Anti-friction bearings are employed extensively in all types of machines, and in many cases are used throughout, including spindles. Clutches are of improved design, gear and other shafts are of larger diameter, and alloy-steel, hardened-and-ground gears are increasingly employed. Automatic lubrication systems, including filters, feature most new designs and in many cases the arrangement is such that the machine will not function if the oil supply fails. Flange-type motors are used

more extensively. Hydraulic operation and control feature many of the grinding, drilling and broaching developments, as heretofore. New applications include complete hydraulic operation of a shaper and hydraulic table-speed shifting mechanism in a new line of vertical turret lathes.

In addition to increased excellence of design, intended to assure maximum quantity or quality of output, or both, facility of change-over to adapt the machine for small-lot as well as continuous or mass production has been a definite objective of many designers. Finally, unit construction that permits building special machines

with standardized parts, which, in case of changes in product design may be rearranged and added to, to make a machine for the same or different operations on another part, is a feature of several designs. This flexibility has been especially highly developed, perhaps, by builders of drilling machines.

Of the machine tools brought out this year, grinders were again among the most numerous. Of outstanding interest in this field also was the development of new diamond-impregnated wheels and of a new material, namely, boron carbide, for the cutting and lapping of cemented carbides.

External Broaching Extended To Cylindrical Parts

ALTHOUGH not new, surface or external broaching has been intensively developed in the past few years, and to existing equipment several new lines have been added. Increased use of the process has been for the most part in the automotive industry, and where applied, production increase and long tool life have made for reduced cost. Applications range from small shackle pins to large en-

gine cylinder blocks. In these, flat and irregular surfaces are machined, the surface broaching being used for the most part in place of various forms of milling. Highly-developed machines of vertical, horizontal and rotary types, both hydraulically and mechanically actuated, are now available. Broaches designed for the particular job and made in sections to permit economical replacement in

whole or in part are employed. In most cases the broaches are moved past the work. Facilities for automatically chucking and unchucking the work have been highly developed.

Extension of the process to the finishing of external cylindrical surfaces is a recent development of challenging interest. A broaching lathe was brought out by a prominent maker of crankshaft turning equipment for use in a large automobile plant for "turning," filleting and facing the three main bearings and the pulley diameter adjacent to the front bearing of a cast alloy crankshaft. It is claimed that the hourly production with this "lathe" is more than twice that of a modern double-end drive lathe using conventional high-speed cutting tools, and that the broaches turn out from 50 to 100 times the number of pieces per grind that can be secured from high-speed steel tool bits. After the crankshaft is placed in the hydraulic chucks and the starter button is pushed, the machine goes through the rough and finish broaching cycle, stops at the unloading position and discharges the work automatically out of the chucks on to the loading fixture. The broach slide then returns to the starting position and stops, ready for the next operating cycle.

Milling Company Builds Broaching Machines

A line of vertical, hydraulically operated units of 2, 5 and 10-ton capacity was introduced by a prominent builder of milling machines. These units are of duplex type; one ram ascends while the other descends. The work-table indexes automatically, the indexing being controlled by a hydraulic mechanism interlocked with the operation of the vertical rams. The broach on the descending ram engages the work in the fixture which has been indexed to the cutting position, while the fixture on the opposite side of the table has been indexed to clear the broach on the ascending ram. Upon completion of the cutting stroke of one ram and the return stroke of the other, the ram stops, the work-table indexes, the rams reverse and the cycle of operations repeats itself. Indexing time is small, and practically continuous operation is obtained. Simple fixtures are employed.

The same company furnished hydraulic equipment of horizontal type for surface broaching bearing lock slots in automobile engine cylinder blocks. The slot is $\frac{1}{8}$ -in. deep and production is at the rate of 112 blocks an hour. Tolerance for width and straightness of the slot is 0.0005 in. The bed and table of this machine are similar to those of a fixed-bed milling machine. The broach is mounted in a holder on top of the table and the table and broach are hydraulically driven.

High Production From Rotary Continuous Type Unit

A rotary, continuous-type external broaching machine with broaching tools mounted in three holders located on a finished platen around the rim of the column was introduced by another company. Broaches of various lengths can be used, and production up to 2000 pieces an hour is obtainable. The first holder contains broaches for roughing, the next for the intermediate cut, and the third for final sizing. An important claim for the principle on which this machine is based is that the rotary movement of the work, in combination with stationary broaches that have a certain type of tooth, gives a shear action that is very desirable in removing metal. The chips are different from those produced by other broaching methods. It is said that this shear effect lengthens the life of tools to such an extent that 200,000 pieces can be obtained from one set of tools.

Hydraulically-operated vertical surface broaching machines having a 42-in. stroke were also developed by this company. Single and duplex types in 6, 10 and 15 ton-capacity are built. Variable-speed controls give surface cutting feeds up to 30 ft. per min. The duplex machine can be furnished with slides arranged to operate simultaneously or independently, so that one slide is on the cutting stroke while the other is returning. Work-tables of index, sliding and tilting types are available.

Indexing Fixtures for Horizontal, Continuous Machine

Indexing fixtures have been applied to continuous surface broaching machines of horizontal, mechanical type. The several fixtures employed are



THE hair-splitting niceties of Earth industries' precision are amazing to Arcturus, who is told that motor cars and airplanes, as well as countless other products, would not be possible without the ability to secure extreme accuracy in countless small but vitally important parts. Equally amazing to him are the huge quantities of these products which the Earth system of manufacture has made so widely available to human kind. "The secret of this," his Earth guide tells him, "is our attainment of precision at low cost." As one of the outstanding exemplifications of this principle, he is told of our modern development of internal centerless grinding, in which fast production, extreme accuracy and rigid inspection are achieved independently of human hands.

mounted on an endless chain and the operator merely drops the work in each fixture as it passes the loading station. Clamping as well as machining and unloading is automatic.

Aline-Broaches Camshaft Holes

Other broaching machines reflecting high development in this class of shop equipment included a special two-way horizontal, hydraulic unit tooled to aline-broach three camshaft holes in an automobile cylinder block. Completely automatic operation is a feature, the operator being required merely to load and unload the work. The cutting speed of the ram is 45 ft. per min. and the return speed is 60 ft. The work-fixture is located on a level with the conveyor that brings the cylinder blocks to the machine, so that the operator can slide them into place easily. The cylinder block must be alined accurately with the broach before the machine can be started. Upon completion of the broaching stroke, an auxiliary oil cylinder pushes the work from the broaching position

to the front loading station, from which the operator slides it on to the conveyor. Machines of the same

design can be supplied for the surface or hole broaching of a variety of other parts.

Centerless Principle Applied to Internal Grinding

AN outstanding development in grinding equipment during the past year was the application of the principles of centerless grinding to internal work. This epochal machine tool is entirely automatic both as to the loading and grinding cycles, and can be supplied with either of two types of automatic sizing devices. It is hydraulically controlled throughout. Straight, tapered, continuous, interrupted or blind holes in parts having finished cylindrical outer surfaces up to 3 in. in diameter and 3 in. in length can be ground. In internal centerless grinding machines it is not possible to pass the work through the machine, but the rotating regulating wheel, together with a rotatable work-rest or stationary blade, and pressure rolls are employed. The regulating wheel, which rotates the work, takes the place of the grinding wheel of the external centerless machine, and the pressure roll takes the place of the regulating wheel, thereby providing the usual grinding throat. As the O.D. of the work is used to generate a path for grinding the bore, concentricity within close limits is obtained. The grinding wheel is trued automatically just before finish work size is reached, and the true, sharp wheel thus provided for the last few cuts gives an excellent finish.

Centerless grinding of the original type, namely external, has been looked upon as best adapted for high production. In the past year or so, however, it has been regularly adapted to grinding small lots. In one plant, more than 200 different parts, including shafts and studs, have been finished by this process, with substantial savings in machining time. Lots range from 12 to 600 pieces, and average about 86 pieces.

Chuck-Type Internal for Small Work

The company that brought out the internal centerless machine also announced a redesigned chuck-type internal grinder for small work. The machine has a fully automatic grind-

ing cycle and can be equipped with automatic sizing devices. A new feature is a hydraulically-operated cross-slide, with which the cross-feed is independent of table reciprocation, so that exactly the right table speed and wheel feed may be selected independently of each other. Separate motor drive for the work-head facilitates grinding tapered as well as straight work. The fixture-operating mechanism is now hydraulically actuated, and the work-head clutch is operated by a hydraulic cylinder controlled by the table.

An internal race grinder featuring hydraulic wheel feed and head oscillation, automatic air-sizing and heavy construction was brought out. The wheel-spindle operates at 12,500, 15,000 and 18,000 r.p.m. A 5-in. hydraulic external race grinder has been developed as companion equipment. With the air sizing device employed raceways are said to be produced within limits of less than 0.0005 in.

Surface Grinder of Simple Design

Surface grinders introduced during the year included a small unit featuring simplicity of construction. The table rests directly on a ground plane surface on the bed and is guided both longitudinally and laterally by a "knee action" device at the rear of the machine. The intermediate table of the conventional grinder is eliminated. Unusual accuracy and finish are claimed for the machine, which has capacity for work up to 8-in. long and 4-in. wide.

A new horizontal, wet surface grinder has been designed for a wide range of utility in both roughing and refinishing operations. Metal is removed from the lower side of the work as the work, resting on a table, is passed over the grinding wheel by means of a chain-driven mechanical feed. The grinding member consists of a ring wheel mounted on a vertical spindle, which is pressed directly into the driving motor. The

spindle and its housing can be adjusted to compensate for wheel wear.

Grinders for Carbide-Tipped Tools

Several new machines for sharpening tungsten and tantalum carbide tools were announced during 1934. One employs diamond-impregnated wheels and is claimed to reduce materially the time required for sharpening. It is also said to grind the tips to thinner sections without danger of chipping and breaking. Tool supporting tables are provided with hardened and ground strips. Graduated adjustments on each table facilitate accurate grinding of correct rake and angle.

For rapid sharpening of cemented-carbide face milling cutters, a milling machine builder has developed equipment designed to sharpen such cutters as quickly as high-speed steel and Stellite cutters, and to reduce the time required for sharpening the steel and Stellite cutters. The cutter spindle is large and is mounted on Timken roller bearings. It has the standard milling machine spindle nose, so that any cutter mounted on a style C arbor can be sharpened without removing the arbor. Large diameter cutters are bolted to the spindle nose, and adapters are unnecessary. The cutter-spindle housing is mounted on an upright that can be swiveled to any desired angle. Graduated dials on all adjustment screws permit simple and accurate set-up. A dial indicator reading to 0.0005 in. is mounted on the wheel-spindle slide; it permits rapid checking of finished cutters and also of cutters before grinding. The wheel spindle, which runs in three anti-friction bearings, carries a massive flywheel to keep the grinding wheel running smoothly at all times.

In the redesign of a well-known tool grinder to facilitate sharpening of cemented-carbide tools, ball bearing spindle mounting replaces the former plain bronze bushing; and V-belts, with the pulley mounted close to the bearings, are used in place of a flat belt and overhung pulleys. The spindle with its ball bearings is now mounted in a large bronze sleeve which is oscillated axially by a cam that revolves at a fixed speed. A bench-type grinder for reconditioning twist drills ranging in diameter from 1/16 to 1/2 in. was brought out by the same company. It is not only

for resharpening dull drills rapidly and accurately but also reclaims, conveniently and economically, badly burned and broken small drills.

New Grinding and Lapping Wheels

A new diamond wheel for shaping and conditioning cemented carbide-tipped tools was recently announced. In the manufacture of these wheels, crushed diamonds, carefully graded, are bonded and applied to a composition form or backing, a layer of about $\frac{1}{8}$ in. being applied to the side of the wheel form for side grinding and to the periphery for cylindrical and other types of grinding. The wheels are then baked. They are held closely to size and are balanced to within a fraction of a gram. They are made in three grits, one for comparatively rough grinding, one for producing a lapped edge of high degree of finish, and the third for producing an exceedingly keen edge and a mirror surface. Grinding is done wet. Unusual stock removal is claimed in grinding with the coarse grit wheel, and it is stated that use of the fine grit diamond wheel eliminates the necessity for lapping. Six and 7-in. sizes are available.

Wheels made of crushed industrial diamonds (bortz) bonded together with Bakelite are being made by another prominent manufacturer of abrasives. These wheels are available in $\frac{1}{4} \times \frac{1}{4} \times \frac{1}{8}$ in. and $\frac{3}{8} \times \frac{1}{4} \times \frac{1}{8}$ in. sizes for internal grinding of carbide wire-drawing dies and in $4 \times \frac{1}{4} \times \frac{1}{2}$ in. size for producing sharp corners on carbide-tipped tools of special shape, such as used in screw machine work. Cup-shaped wheels 3 in. in diameter, $\frac{3}{8}$ in. rim, are also made for lapping small carbide-tipped tools and for grinding clearances on surface broaches, reamers and milling cutters tipped with cemented carbide. Thin cut-off wheels and a $7 \times \frac{1}{2} \times \frac{1}{2}$ in. straight wheel are also available. These wheels are made in three different grain sizes.

Boron Carbide for Lapping

The same company recently announced the development of an important new material, namely boron carbide, one use of which is in cutting and lapping cemented carbides. It is a combination of the rare metal boron and ordinary carbon, and is so hard that it readily scratches and cuts

the hardest of known synthetic materials. It is harder than the cemented carbides and silicon carbide, and is little affected by heat up to 1000 deg. C. In powdered form this boron carbide is an extremely hard abrasive and may be used for lapping cemented carbides and for other appli-



cations where diamond dust has been necessary. In molded form the material is extremely resistant to abrasion and may be used where an unusually hard, smooth material is required. Other uses include wire drawing and extrusion dies.

In honing equipment, one company

developed hones, fixtures and machines for large and small lot honing of automotive connecting rod bores that serve as seats for steel-backed babbitted bearings. Each connecting rod is honed individually by a special hone in combination with a fixture that locates the bore concentric with the hone and holds the rod in place without distortion from excessive clamping pressure. A machine with flexibility to permit honing bores of various diameters and lengths was also brought out by the company. The design is intended to assure synchronous uniformity between the rotary motion which produces the roundness of bores and the reciprocating motion which produces straightness of the bores. The machine can be used for single or multiple-spindle operation and also for honing of external surfaces.

For honing tubing and cylinders of a size or length that cannot be handled in a vertical type machine, a new hydraulic horizontal unit has been made available. Features include the method of reciprocating the carriage, on which is mounted the spindle, the latter driven by an electric motor on the carriage. A fluid motor is employed to give the full hydraulic action the same as that obtained with a hydraulic cylinder, yet makes possible a main bed of much shorter length. The machine is for bores up to and including 5 in. in diameter.

Turret Lathes Provide For Use of Newer Tools

IN lathes, new machines of turret type with power, strength, speed and handling conveniences that permit effective use of all available cutting materials, including those classified as super-hard, were particularly well represented.

One of them, of universal ram-type and built in $1\frac{1}{2}$ and 2-in. bar capacities, has 12 forward and reverse spindle speeds in two standard ranges, 20 to 1000 and 40 to 2000 r.p.m. All speed changes are controlled by a single-lever dial selector on the headstock. The carriage apron is equipped with a sliding gear transmission that gives nine longitudinal and cross feeds, controlled through a single-lever dial selector. Two motor

drive arrangements are available, namely, flange-type motor mounted integral with the headstock, and cabinet leg mounting with the drive through multiple V-belts. The main spindle and all shafts in the headstock are mounted in anti-friction bearings, and gears are hardened and ground. The universal bridge-type carriage is unusually heavy. The hexagon turret is equipped with an automatic clamping ring; return movement of the turret slide unclamps and indexes the turret and forward movement clamps it. The bar feeding mechanism is so designed that the operator, standing in his normal position and using a single lever can unlock the collet chuck, feed the bar through the

spindle, clamp the chuck, and while the machine is running, "ratchet" the stock carrier back for another series of feeding operations.

Motor-In-Head Lathe Has Speeds Up To 3600 r.p.m.

A new $\frac{5}{8}$ x4-in. turret lathe has its motor built into the head, the rotor being mounted directly on the spindle and the stator within the head housing. Fan blades circulate air at high velocity around the spindle bearings and motor windings. The machine is designed to use carbide and diamond tools and is particularly adapted for work of small diameter and for non-ferrous metals. Speeds of 600, 1200, 1800 and 3600 r.p.m. are available in either direction. Two levers control the spindle electrically through a drum-type controller and automatic relays. A large band brake prevents spindle rotation when attaching chucks, loading work, etc. Anti-friction bearings are employed throughout. A new friction finger bar feed is employed.

The same company brought out a 1-in. bar capacity turret lathe, the six-speed all-gear headstock of which can be furnished to provide speed ranges from 67 to 740 r.p.m. up to 134 to 1480 r.p.m. Double-row Timken bearings are provided at the front end of the spindle and a straight roller bearing at the rear. All other shafts also run in roller bearings. All gears have ground teeth, and the forward and reverse multiple-disk clutch has ample area to permit reversing at high speeds. A new type of automatic circumference binder ring permits clamping and indexing of the hexagon turret by rotating the turnstile. New design also covers a combination friction finger and ratchet bar feed.

Compact Turret Lathe

New No. 3 universal and plain turret lathes with either a 12 or eight-speed all-gear head and with speeds up to 1525 r.p.m., were introduced by another builder. These machines have $1\frac{1}{2}$ -in. bar capacity and $15\frac{3}{8}$ -in. swing. They are driven by a flange-type motor bolted to the head, with the rotor pressed on to the first drive shaft. Anti-friction bearings are provided in the head and for the spindle and high-speed gears are of helical type. In addition to the double multiple-disk clutch for start-

ing, stopping and reversing, the head is provided with another clutch through which speed reduction of about 2 to 1 can be obtained for threading, reaming and other operations. Sliding gears furnish all other speed changes and permit of a compact head. Use of spindle end of flanged type is a feature. The turret slide and saddle is of new and strengthened design. Cantilever construction of the saddle permits the cross-slide carriage to pass partly beneath it, thus giving the turret slide a long bearing in the saddle and reducing overhang.

A vertical turret lathe featuring a simplified hydraulic table speed-shifting mechanism with a large direct-reading dial speed indicator has been made available in 56, 66, 76 and 86-in. sizes. Anti-friction bearings are employed throughout except for the table, and all parts are designed for heavy-duty load of four heads. The cross-rail may be equipped with one ram-type and one turret-type head or with two ram heads. Side heads are mounted directly on the bed ways, and their slides have bar steel rams with four-face indexing turrets. Individual feed-works for each side head make for flexibility. Clutch and brake levers are located at each side of the table.

Vertical Automatic for Small Work

The same company has introduced an eight-spindle vertical automatic in two sizes for small, high-speed work. Flexibility in change-over from one job to another is a feature. Eight spindles allow one station for chucking and seven for the work, with speeds independently variable at each station. Forty-one changes of speed, ranging from 168 to 1509 r.p.m. on the smaller machine, and from 84 to 754 r.p.m. on the larger, are provided. In addition, by means of a "dual range" change feature, a blanket 2 to 1 reduction of all speed settings at the work stations is obtainable. Feeds, 41 in number, range from 0.004 to 0.036 in. The seven screw-type feed-works operate independently for each work station. Chucks are mechanically power operated, are controlled by foot lever, and jaw pressures are adjustable. The company's patented double indexing feature is available. Anti-friction bearings are used throughout, and

the machines are equipped with pressure lubrication arranged for machine cut out in event of lubrication failure. The capacity of the smaller machine is 8 in. diameter and of the larger, 12 in., with 10 in. for height.

A new 6-in. stub lathe, automatic and semi-automatic types, has a number of features that suit it for cemented-carbide tooling. Headstock and bed are cast integral. Ball-bearing live tailstock center and lever-operated quick-acting tailstock are other features. New mechanisms for accurate engagement of feeds on the semi-automatic type and complete control on the automatic machine have been developed. Modifications of standard specifications include a two-tool slide for each front and rear carriage, and an angular arrangement of four slides.

Tools Accessible In New Screw Machine

Reduction of idle time was an outstanding objective in designing a new line of four-spindle automatic screw machines with capacity from $\frac{7}{8}$ to $2\frac{1}{4}$ in. The entire tooling section has been opened up to facilitate tool inspection and replacement, and the tools are supported by heavier slides, and the slides by a more massive bed, to assure longer tool life. High spindle speeds permit maximum use of modern cutting tools. Spindles and all shafts run in anti-friction bearings. Shafts are of large diameter, and gears that operate at high speeds or under heavy load are of helical



type. Rapid and smooth indexing of the spindle carrier, which is rigidly supported and has been substantially increased in length, contributes to high productive capacity. Wide-faced steel cams are used in place of barrel cams. The same company has brought

out a new six-spindle line featuring interchangeability of parts as between the four and six-spindle models—this with the object of reducing investment and of removing restrictions on the employment of different models in a production line.

Milling Machine Designed For Higher Output

MILLING machines embodying wider speed and feed ranges, simplified control and other features making for increased productiveness were added to several established lines during the past year. New die sinking equipment included a large unit featuring complete electrical control of all movements.

Two-way automatic control, by which the table can be operated automatically or manually, or with a combination of both, was added to one line of manufacturing millers. A compact hydraulic unit in the saddle affords complete automatic control in a wide variety of milling cycles, both one and two way, with or without spindle stop. Two plungers at left and right of a "tripping post" control the operation of the unit for automatic reversal of the table, and its rapid return.

For economical milling of small parts in either large or medium lots, another company brought out a new highly-developed automatic. Complete automatic working cycle, including 400 in. per min. power rapid traverse and dog control of intermittent feed and rapid traverse in any combination or direction, is provided. Sixteen table feeds and eight spindle speeds, the latter up to 1800 r.p.m. in the high series, are available. The spindle is mounted in anti-friction bearings, and helical gears are employed in the drive. Automatic spindle stop can be supplied and used with automatic table working cycles.

A new high-speed dial type miller with speeds up to 1500 r.p.m. in the Nos. 1 and 2 sizes and up to 1300 r.p.m. in the Nos. 3 and 4 sizes has also been made available. There are 21 spindle speeds and 32 feeds, the latter grouped into two series. Tooth profiles of gears in the spindle drive are finished after heat treating and the 13 highest speeds are obtained through helical gears, further to assure quiet running.

In a new light-type No. 2 universal

mill the height of the spindle has been lowered to permit better view of the cutter and work, and to reduce fatigue in work handling. Sixteen spindle speeds, from 40 to 1300 r.p.m., are arranged in two series. Speeds are changed through a rotating lever on the side of the column in conjunction with the back gear lever. Single-lever feed control for all power movements is also provided. Ground tooth gears are used throughout the speed train. The face of the column has been set back to give added clearance for vises and work. A mounted swinging crane permits convenient positioning of universal milling and slotting attachments. A short lead and feed reducing attachment, driven from the table screw, is another feature.

The same company introduced new No. 2 vertical-spindle millers having greatly increased speed and feed ranges and direct-reading dials that show the speeds and feeds in use. There are 32 changes of spindle speed, from 20 to 1300 r.p.m., in either direction. Feed changes, also 32 in number, are likewise effected by single rotating lever. Control is from both front and rear.

Electrically-Controlled Die Sinker

For roughing massive die blocks a maker of large milling machines recently supplied an adjustable-rail die sinking machine, all movements of which are electrically controlled. The machine weighs 178 tons and is designed to take work 10 ft. wide, 7 ft. high and 14 ft. long. Conventional hand levers are eliminated by the electric push-button control, either from pendant box or stationary panel. The rail carries two heads, both



RUMOR travels fast throughout the universe, it seems. Arcturus tells his Earth guide that the inhabitants of distant stellar systems have heard that the Earth is the home of strange mechanical robots; creatures of iron and steel which work untiringly, skillfully and almost think. So his guide tells Arcturus of the principle of automaticity; how man has learned to impart the power of repetitive thought to mechanizations, thereby tapping the secret of mass production and minimum costs. As an example, Arcturus is shown a machining department in a motor-making plant, where automaticity perhaps reaches its present zenith.

driven through a single feed box, but each having a manually-operated selector by which its motions are set.

The pendant head which hangs over the bed of the machine is unusual in many respects. It provides push buttons for the full range of remote control, and is easily moved up or down as well as sideways. The upper two divisions of the pendant head, which control the two spindles, have a red background, and the remaining three divisions are black, thus providing a means of quick identification by the operator. Each division has a series of engraved lines on its face. In some cases these are vertical, in others horizontal and in others a combination of both. With these, the operator, by feeling over the pendant head, can soon learn to identify one section from the other. These markings are duplicated on the stationary control panel.

Drilling Machines Provide Increased Flexibility

NEW self-contained machine units that may be removed in whole or in part and recombined or added to in case of changes in product design

were again prominent in announcements of new drilling equipment. Upright drills included two or more hydraulic-feed units, and in radials, a

new bracket construction for mounting multiple-spindle drill heads was introduced.

One of the new developments embodying the unit construction principle provides versatility in respect to adaptability to change for different types of operation, or from one metal-removing process to another, as well as to different products requiring a similar operation and to use in the building up of larger machines. Seven functional elements, namely, fixture pedestal, bed wing, slide, saddle, driving unit, work unit, and fixture are provided. By arranging these individual units in different combinations, a wide variety of types and designs of machines can be developed. The driving unit contains two built-in electric motors for driving and feeding, and the necessary control mechanism to provide feed cycles for drilling, tapping, boring and milling. The work unit carries the cutting tools for the operations required; it is carried on the saddle directly in front of and is driven by the driving unit. A number of interesting combinations of these units in a coach and truck plant have been recently described.

Self-contained hydraulic drilling and tapping units and standardized unit beds, fixture pedestals, angle spacer plates and columns were made available by a large maker of drilling machines. By using special spindle boxes on the units and a special hold-

ing fixture, a wide variety of machine types is obtainable.

Drill Unit Has Square Ram

A new self-contained hydraulic drill unit featuring a large, square ram was also introduced. The units are for drilling, reaming, boring and milling and can be used in any position and at any angle. The hydraulic system of each comprises two pumps, one for rapid traverse only and the other for the feed. Pumps and spindle are driven by a motor inclosed in the base of each unit.

A number of interesting way-type and other special combination machines for multiple operations on automotive parts were developed during the year. In vertical or upright drills, two machines feature application of hydraulic feeding pressure directly over the center of the cutting tool or multiple spindle head. A new line of upright drills having wide range of speed; speed and feed selection through single levers; and motorized spindle construction was also brought out.

A new bracket construction for mounting multiple-spindle drill heads was developed by a prominent builder of radials. This bracket, which may be removed easily, is arranged to counterbalance the weight of the drill head, causing quick return of the head from the work. An adjustable center-distance drill head can be used.

another company for boring and facing rear axle housings is of unique design. Six spindles in opposed positions of two spindles each and carrying multiple-blade boring tools and facing cutters, complete three steps of operation — roughing, semi-finishing and finishing. The spindles at the left side are used for the outside holes, while those at the right bore the inside holes, the spindles traversing as a unit by means of a hydraulic arrangement. The work-carrying fixture is mounted on a pivoted table which is hydraulically operated to raise upward from the loading position into the three working positions.

Camshaft and crankshaft bearing holes in cylinder blocks are bored at the rate of 90 blocks an hour on a machine having stub tools mounted on a long heavy slide above the work, a construction said to give markedly greater bearing area than possible with the conventional boring bar. High rates of production are attributed to short bar travel and easy loading and positioning of the work. Multiple-blade cutters can be used.

Horizontal Boring Machines

Unit head construction, with driving motor, feed and traverse mechanisms and control levers mounted on the head, is an outstanding feature of a new line of horizontal boring, drilling and milling machines. From the motor the drive is entirely through short shafts and spur gears direct to the spindle. Complete control of the machine is provided through levers on the head. With this arrangement, all controls are always in the same relative position, regardless of the position of the head or table. Twenty-four speeds and feeds are obtainable. Feeding of the spindle is accomplished through a lead-screw and rotating nut; for tapping to tool-room tolerances a second lead-screw for exclusive use in tapping can be provided.

Another new horizontal boring, drilling and milling machine designed with strength and massiveness for heavy duty is equipped with two spindles. The large main spindle is for boring and heavy milling and runs at speeds up to 500 r.p.m. and the second spindle is for high-speed drilling and tapping and can be reversed at speeds up to 1500 r.p.m. The main spindle can be declutched when not in use. Thirty-six speeds and 18 feeds available for both spindles.

(CONTINUED ON PAGE 279)

Variety of New Boring Equipment

IMPROVED boring machines of all classes, from precision horizontal units to large vertical mills, were brought out during the year. New horizontal units employing cemented-carbide or diamond tools included a double-end mass production machine the bridges of which have capacity for four boring heads. Weighing 5 tons, the machine is of massive construction, and is designed to eliminate even the slightest vibration. Boring speeds can be varied from 360 to 3270 r.p.m. by changing multiple V-belt pulleys. Clutch and brake units for starting and stopping the boring heads are of self-adjusting, hydraulic type. The machine can be arranged to perform several cycles, change from one to another merely requiring substitution of compara-

tively simple parts. A new control of the reversing valve allows the table to drift into a positive stop for facing, and the boring heads are stopped with sufficient allowance for cleaning up a facing cut. Diameter of holes bored ranges from about $\frac{1}{4}$ to $6\frac{1}{8}$ in., inclusive.

The precision boring machine of another builder has been tooled for finishing steel connecting rods for refrigerator units. With four boring units at each end of the machine, eight spindles are constantly at work except during loading. Gross production is set at 300 rods an hour. The tantalum carbide tools employed remove about 0.020 in. of metal, the spindle speed being 750 r.p.m. and the feed 0.01 in.

A horizontal machine developed by

» » » Poor Richard's

Chronology of the Second Year



Jan. 2 . . .

THE New Deal New Year starts with organized labor seeking to push gains under Section 7-a (collective bargaining) of the National Industrial Recovery Act.

Insistence of American Federation of Labor, dissatisfied with its failure to achieve its objective at plants of Weirton Steel Co. and Budd Mfg. Co., results in preparation of bill by Senator Wagner of New York, chairman of Committee on Education and Labor. Offered as amendment to Section 7-a, the measure would insure "freedom of contract" to labor, abolish company unions, and broaden authority of National Labor Board.

President Roosevelt is reported to be contemplating legislation for new NRA machinery, including setting up of board to protect small business, establishing closer relationships between NRA and board and safeguarding of anti-trust provisions.

Harold L. Ickes, Public Works Administrator, announces signing of contracts with Pennsylvania Railroad for a PWA loan of \$77,000,000 to finance carrier's electrification work between Philadelphia and Washington and the construction of 7000 freight cars and 100 electric locomotives.

Jan. 9 . . .

ROW between steel industry and American Federation of Labor again breaks out at

hearings before National Labor Board on efforts of United Mine Workers to unionize steel company captive coal mines. Led by Nathan L. Miller, counsel for United States Steel Corp., numerous steel companies challenge jurisdiction of board and decline to recognize union but express willingness to negotiate with members of union as individuals.



Jan. 16 . . .

COMPLAINTS presented by NRA Consumers' Advisory Board before Division Administrator A. D. White-side against basing point system of iron and steel industry, and omission of Youngstown, Ohio, as basing point for sheets and plates. Charges also made that uniform prices for steel have been established, that Pacific Coast warehouse prices will eliminate small users of structural shapes in that area and that increased quality and quantity extras have been excessive.

NRA is considering shorter work week. Administrator Hugh S. Johnson again insists that 40-hr. week is too long if unemployment is to be absorbed, but declares 30-hr. week, demanded by organized labor, would bankrupt industry.

NRA becomes worried over price structures under codes because of both excessive prices and price cutting and calls coal conference as result of spread of chiseling.

Interstate Commerce Commission approves PWA loan of \$77,000,000 to Pennsylvania Railroad.

Southern Pacific applies to commission for authority to borrow \$12,970,735 from PWA for purchase of 40,000 tons of rails and necessary track accessories and for repairs.



Jan. 23 . . .

QUIETLY brewing for some time, row between Federal Trade Commission and NRA over basing point system in iron and steel industry is brought to surface by President's executive order giving commission and Department of Justice jurisdiction to pass upon complaints against practices under codes. Order also follows Senatorial attacks charging NRA with oppressing small enterprises. General Johnson in bristling radio broadcast in New York strikes back vigorously at both the commission and Senatorial critics.

Erie Railroad applies to Interstate Commerce Commission for authority to borrow \$11,845,750 from PWA for purchase of 3175 freight cars, 125 passenger coaches and eight all-steel mail cars.

Boston & Maine applies to commission for authority to borrow \$3,300,000 from PWA to purchase 30,000 tons of rails, to repair and air-condition equipment and to purchase 10 all-steel passenger coaches.

Almanac *(With Apologies to Benjamin Franklin)*

of the New Deal at Washington



Jan. 30 . . .

DESPITE his bold attack on NRA critics, General Johnson announces plan to set up board of prominent business men to consider appeals of small business or units of industry and consumers "allegedly oppressed by the operation of larger groups under code." General also denotes solicitude for small enterprises by selecting Divisional Administrator Whiteside as special assistant on credit and finance to look after the needs of "smaller business where the difficulty of obtaining credit may be one of the severest handicaps in competing with larger enterprises."

Chesapeake & Ohio makes application to Interstate Commerce Commission for approval of PWA loan of \$18,290,000 for purchase of 7800 freight cars and 26 passenger cars.

Feb. 6 . . .

SENATOR BORAH'S resolution calling upon Federal Trade Commission to submit report on price fixing under steel code is adopted as commission continues to withhold report, quietly made. Simultaneously yielding to growing criticism, NRA starts drive against price fixing and plans for code enforcement. A Presidential order growing out of

Weirton Steel Co. case permits employees to take polls outside of plants to determine whether they want to hold elections to choose representatives for collective bargaining.

Definite opposition to code restrictions on use of machinery makes first appearance at NRA hearings.

Approval of Interstate Commerce Commission of PWA loans of \$5,062,000 for New York, Chicago & St. Louis and \$1,212,000 for Lehigh & New England for purchase of equipment is asked.

PWA contracts signed with Southern Pacific for loan of \$12,000,000 for purchase, among other requirements, of 40,000 tons of rails, 364,000 lb. of spikes, 650,000 tie plates, and to make heavy repairs to 748 locomotives, 3811 freight cars and 406 passenger cars.

Allotments for loans to railroads by PWA reach total of \$199,607,800, of which \$41,000,000 is set aside for future distribution for rails and fastenings.

Feb. 13 . . .

LOOKING to determination by NRA of policy on code price provisions and shortening of hours of work, General Johnson announces meeting on March 5 of some 275 to 300 code authorities.

Senator Wagner introduces bill for unemployment insurance.

Squabble over employee representation boils again. Weirton Steel Co. refuses to submit payroll list to National Labor Board, with American Iron and Steel Institute standing back of company. Delegation from Amalgamated Association of Iron, Steel and Tin Workers calls upon President and presents petition for election signed by workers.



Feb. 20 . . .

GENERAL JOHNSON asks John Q. Public to gather his dead cats and attend "gold fish bowl" meeting, beginning Feb. 27, for free-for-all criticism of NRA. At the same time he invites technical criticism from more than score of country's outstanding economists, who are asked to join Administration in study of open price associations.

Thomas F. Veach, counsel for Republic Steel Corp., tells National Labor Board company will take such steps as are lawfully necessary to uphold employees' representation plan.

Feb. 27 . . .

WIDENING its drive for unionization of the iron and steel industry, Amalgamated Association of Iron, Steel and Tin Workers protests to National Labor Board against Pittsburgh district steel companies in connection with conduct of elections to choose representatives for collective bargaining.



March 6 . . .

RUNNING from Dan to Beersheba, criticisms of all sorts are fired in the NRA

Poor Richard's Almanac (Continued)

field day for the public. General Johnson announces a 12-point program for reshaping codes. Organized labor especially demands shorter hours, with greatest stress on the 30-hr. week. Consumers kick against price provisions.

President issues executive order giving National Labor Board a status equal to that of National Compliance Board, with right to review rulings of former taken away from latter board.

Senator Wagner introduces bill to set up permanent National Labor Board and to abolish company unions. Meets with storm of protest from industries throughout country. Measure taken as admission that old board is without jurisdiction in compelling industries to hold elections, submit payrolls, etc.

Board turns Weirton case over to Department of Justice with recommendation that latter "take immediate action."

Consumers' Advisory Board of NRA makes report to General Johnson in which it recommends elimination of existing basing point system in iron and steel industry. Other sweeping changes in steel and other codes also urged by board, including revision of price provisions by use of individual cost rather than average cost for an industry.

Ralph E. Flanders, Jones & Lamson Machine Co., Springfield, Vt., warns meeting of code authorities of effect of shorter hours and is followed by other industrialists in protest against proposed move. President Roosevelt, opening conference, had taken opposite stand, asking for 10 per cent reduction in hours and like increase in wages.



March 13 . . .

WALTER S. TOWER, executive secretary, American Iron and Steel Institute, at NRA code authority group conference on small

enterprises explains and defends steel code provisions.

General Johnson told the code authorities that the meeting, the largest gathering of American business men ever held, was a disappointment. Previously he had urged adoption of the President's proposal for a 10 per cent reduction in hours and a similar increase in wages and had served notice that the Government would "crack down" on violators of the collective bargaining section of the recovery act.

The most concrete result of the meeting was the setting up of Durable Goods Committee headed by George H. Houston, president of the Baldwin Locomotive Works.

Speeding up of PWA loans to railroads to purchase equipment is begun.

March 20 . . .

FEDERAL TRADE COMMISSION report, attacking steel code and NRA, is submitted to Senate.

Tense labor situation in steel, automobile and other industries, centering about demands of organized labor for union recognition, seriously threatens recovery program and receives major attention of Administration.

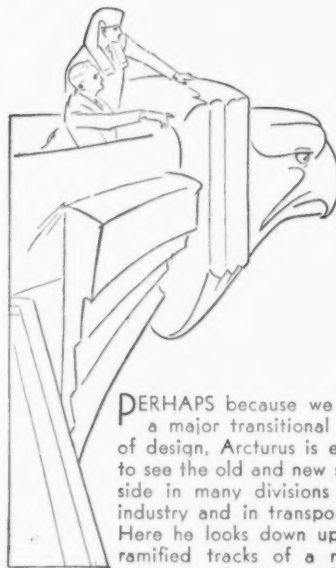
Department of Justice files suit in Wilmington, Del., against Weirton Steel Co. to compel election under supervision of National Labor Board, as demanded by Amalgamated Association of Iron, Steel and Tin Workers.

March 27 . . .

WILLIAM LONG, member of Amalgamated association, employed by Weirton company, tells Senate Committee on Education and Labor that there will be a general steel strike unless Congress passes the Wagner bill.

Mr. Long and delegation from Amalgamated association call at White House, Department of Justice and NRA, asking for immediate action against Weirton company. Also ask Compliance Director W. H. Davis to deprive company of Blue Eagle.

Senator Borah uses Federal Trade Commission report to make attack in Senate on steel code, urging that it be completely redrafted



PERHAPS because we are in a major transitional period of design, Arcturus is enabled to see the old and new side by side in many divisions of our industry and in transportation. Here he looks down upon the ramified tracks of a railroad terminal and sees, together, the old and the new in transportation mechanization. He notes that the Earth engineer seems to be working toward lightness and speed in transportation. He is told of the great strides recently made in this direction, as well as in construction, in the use of formed sheet metals. He is also told of the parallel development of mechanisms for shearing and forming metals which make possible our streamlined trains and Empire State buildings.

and asking full restoration of anti-trust laws.

Delegation of Amalgamated association workers at Duquesne, Pa., plant of Carnegie Steel Co. petitions Senator Wagner, as chairman of National Labor Board, to conduct election under board's supervision.

President's settlement of threatened automobile strike by setting up board and providing for proportional representation in collective bargaining is hailed as victory for open shop.

James A. Emery, general counsel of National Association of Manufacturers, attacks Wagner labor bill at hearing before Senate Committee on Education and Labor.

April 3 . . .

REORGANIZATION of NRA takes definite shape with order by General Johnson proposing setting up by all industries under codes of industrial relations commit-

Poor Richard's Almanac (Continued)

tees or boards to adjust labor disputes. Administrator also asks capital and consumers' goods industries to inform him of number of men they can reemploy as he seeks to increase purchasing power by general wage advances. Move is made as advances in wages are announced by iron and steel, automobile and other major industries.

Harold L. Ickes announces that \$1,041,310,468 of the \$1,380,825,370 allotted for Federal projects by PWA is in construction contract stage.

General Johnson, irritated over Federal Trade Commission attacks on steel code, says NRA will make answer.

April 10 . . .

STEEL executives and their employees appear before Senate Committee on Education and Labor and strongly attack Wagner labor bill.

NRA moves against code violators, high prices and chiseling, and proceeds with reorganization as code making virtually ends and administration through decentralized force is planned.



April 17 . . .

PREPARING for enforcement drive, NRA completes reorganization of Compliance Division and announces code eagle will be issued after April 30. Labor troubles, however, harass industry and keep White House, NRA and Labor Board in state of high tension in efforts to settle disputes.

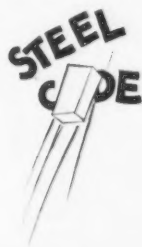
Durable Goods Committee in report declares that securities legislation is obstacle to investment in securities which finance capital goods industries.

April 24 . . .

STARTED April 4, intermittent "hearings" on steel code end before Darrow

Recovery Review Board, which took role of persecutor attacked code and assumed intolerant attitude as code was explained by Mr. Tower.

Though declaring basing system of steel industry is



wrong, General Johnson defends steel code as one of best examples of how New Deal is working and cites correspondence from small units in steel industry asking for continuance of code as means of protection.

May 1 . . .

LABOR trouble, eternally bobbing up, again becomes a sore spot as organized labor becomes restive over the proportional plan for settlement of disputes set up by President under National Automobile Labor Board. With disputes in automobile, steel, textile and other industries becoming more acute, National Labor Board holds out for majority representation, as urged by organized labor; yet application of that principle by board in Real Silk Co. case is protested by organized labor when company union wins election.

President approves Tariff Commission recommendation for no change in the present duty of 1/4c. per lb. on cotton ties.

George H. Houston, chairman of Durable Goods Committee, submits committee report looking to improvements in NRA.



May 8 . . .

CHAMBER OF COMMERCE of United States at annual convention ap-

praises New Deal, and, becoming sharply critical in spots, brings pointed suggestions from President Roosevelt that business should stop crying "wolf."

Labor Advisory Board of NRA, with President Green of A. F. of L. acting as chairman, lays down principle that under no circumstances will a company union representative be named as a member of industrial relations boards.

Loans to railroads by PWA aggregate \$199,607,800, of which \$30,000,000 was for the purchase of rails.



May 15 . . .

APPROACHING end of its first year of operation, NRA dumps nuisance codes as General Johnson works toward simplification and more self-government by industry.



May 22 . . .

SIZZLING with fiery onslaughts on the steel code, Darrow board report recommends abolition of all the code provisions except those relating to labor. Equally as hot, if not hotter, are the blistering replies of General Johnson and Donald Richberg. The General asks the President to abolish Darrow board and Mr. Richberg vigorously defends code's provisions. Newly coined phrases are so abundant that, if convertible into negotiable currency, there would be enough funds to finance the rather costly New Deal program.

Poor Richard's Almanac (Continued)



May 29 . . .

WAGNER bill is modified, but industrialists insist it still contains dynamite as it is reported to the Senate.

Steel code revisions are agreed upon between industry and NRA and await Presidential approval.

Delegation from Amalgamated Association of Iron, Steel and Tin Workers lodge complaints against steel industry with National Labor Board.

June 5 . . .

APPROVED on Memorial Day by the President, to become effective June 11, the revised steel code carries major amendments in response to criticisms. Provides additional basing points, with trend toward quoting prices on basis of areas of production; omits "cost recovery" provisions; authorizes deductions from "delivered prices" including all-rail rates, when delivery is made by water or motor transportation; eliminates 10-day lag provisions in meeting lower prices; flatly establishes 8-hr. day, except for emergencies. President orders elections under Government auspices, as "occasion may demand," to determine representatives for purpose of collective bargaining. Also authorizes joint study by NRA and Federal Trade Commission on basing point system, report to be submitted in six months. NRA summary cites benefits from code during "trial" period as code is given greater permanency.

General Johnson, in course of two-hour conference with President W. A. Irvin of United States Steel Corp., suggests settlement of threatened steel strike through labor board like that set up for automobile industry. Administrator states Mr. Irvin promised to lay proposal before American Iron and Steel Institute.

Either "collective bargain-

ing" or a national strike! Such is the bellicose challenge thrown down by William J. Spang.

General Johnson says he sees no reason for steel strike and that workers have not laid proper ground for collective bargaining.



June 12 . . .

MR. SPANG and E. J. Forbeck, Amalgamated representatives, in letter to President, call joint proposal of General Johnson and American Iron and Steel Institute for three-man industrial relations board an insult and ask that plan be "thrown into the waste basket." President holds conferences with General Johnson, Mr. Richberg, Senator Wagner and others in effort to avert steel strike and is reported to have proposed legislation for industrial relations boards for steel and other industries.



June 19 . . .

PRESIDENT authorizes Secretary of Labor Frances Perkins to negotiate with steel industry and Amalgamated association representatives in effort to head off strike. Joint resolution, rushed through Congress partly by reason of threatened steel strike, sets up boards to arbitrate labor disputes and takes place of Wagner Labor Disputes Bill. Administration reciprocal tariff legislation, bitterly fought in Congress, becomes

effective, establishing entirely new principle in country's basic tariff policy.

Amalgamated association, through Miss Perkins, presents letter to President urging Pittsburgh convention plan to settle strike, which was "postponed" after convention was addressed by President Green.

June 26 . . .

MISS PERKINS sends labor's Pittsburgh plan to American Iron and Steel Institute. Plan provides for impartial board of three, selected by President, to supervise elections, and for majority representation.

July 3 . . .

APPPOINTED by President Roosevelt June 28, National Steel Labor Relations Board is organized following day. Set up under the Wagner joint resolution, the board has before it records in connection with threatened steel strike. Members of board are Chief Justice Walter P. Stacy of North Carolina, chairman; Admiral Henry A. Wiley, U. S. N., retired, and James Mullenbach of Chicago. Executive order establishing board provides for majority representation, with provision that no group of employees shall be denied right to present grievances to employers.

Iron and steel and other industries are greatly agitated over Presidential order of June 29 which says any bidder for a municipal, State or Federal Government contract will be held to have complied with code requirements if he quotes a price not more than 15 per cent below his filed price. Fear felt invitation to slash code prices on such contracts will lead to breakdown in code prices generally.

National Labor Relations Board, established June 30 by Presidential order, and provided for in Wagner resolution, succeeds National Labor Board. Created as central and permanent agency to conduct labor elections and act as voluntary arbitrator in labor disputes where special boards have not been created, it consists of three impartial members as against the partisan character of the old board.

July 10 . . .

BESIEGED with inquiries from industries throughout country, NRA interprets President's price-cut order to be applicable to Government business only, despite statement orally made by President that order gives the public the advantage of same reductions that bidders offer to Government agencies.

National Steel Labor Relations Board announces receipt of word from Myron C. Taylor, chairman of United States Steel Corp., that the corporation is ready to supply board with data bearing upon its relations with its employees. Charlton Ogburn, New York, attorney for Amalgamated Association of Iron, Steel and Tin Workers, presents board with information regarding threatened steel strike and assures board of association's readiness to cooperate with it.

Along with other industries, iron and steel industry, according to General Johnson, asks for exemption from President's 15 per cent code price reduction order.



July 17 . . .

ADMINISTRATOR JOHNSON reports to President that NRA has passed from stage of one-man job and urges reorganization under commission form of administration, prepared to concentrate on administrative work as soon as it winds up codification, nearing end.

July 24 . . .

LEGAL division of NRA, passing upon President's price reduction order for steel industry, says prices may be reduced on Government business and filed with code authority without affecting general price structure. Nevertheless order is source of continued disturbance to industry.



July 31 . . .

FIRST hearing under reciprocal tariff act is held by Committee on Reciprocity Information, Tariff Commission, on proposed treaty with Cuba. Under procedure adopted, domestic interests opposing lowering of duties are left in dark as to what products would be affected.

Aug. 7 . . .

WITH code violations mounting, prestige of NRA diminishes and uncertainty over price policy also becomes a disturbing factor.



Aug. 14 . . .

PRESIDENT returns from Hawaii convinced of soundness of New Deal program and in speech at Green Bay, Wis., while en route to Washington, in face of growing restiveness of business over Governmental regimentation, says the people "have received at least a partial answer to their demands for action, and neither the demand nor the action has reached the end of the road." Address looked upon as a turn to the "left."

Amalgamated Association of Iron, Steel and Tin Workers resumes agitation in steel industry and files petitions and complaints with National Steel Labor Relations Board with result that board prepares for first hearings to begin Aug. 16 at Pittsburgh covering four cases regarding collective bargaining.

Ralph L. Harding, Cleveland, named chief, Iron and Steel Division, Bureau of

Foreign and Domestic Commerce, to succeed Luther Becker.

Aug. 21 . . .

REORGANIZATION of NRA expected to be announced soon by President.



Aug. 28 . . .

DONALD RICHBERG, director National Emergency Committee and NRA general counsel, prepares report looking to coordination of New Deal alphabetical soup agencies. Said to have been found necessary because all combinations from alpha to omega have been over-worked in violation of letter code.

Sept. 4 . . .

DECISION of National Labor Relations Board in Houde Engineering Corp. case, holding representatives of majority shall constitute exclusive agency for collective bargaining, and announcement of National Steel Labor Relations Board that it would give consideration to petition for new election of employees of Weirton Steel Co. prove sources of disturbance to employers.

Concessions on American iron and steel imported into Cuba granted by reciprocal trade agreement with that country.

Presidential "price reduction" order meets no response in bids on steel for Navy yards.



Sept. 11 . . .

PRESIDENT at Hyde Park confers with General Johnson regarding reorganization of NRA. Declared to have

Poor Richard's Almanac (Continued)

turned to definite policy of continuing collective bargaining and minimizing price control in codes.

Houde Engineering Corp. refuses to abide by National Labor Board decision. Board refers case to NRA compliance division with recommendation for removal of Blue Eagle from company. Indicates case will be referred to Department of Justice.

Sept. 18 . . .

GRATIFIED over Houde decision, organized labor through Amalgamated Association of Iron, Steel and Tin Workers, increases pressure for union recognition in the iron and steel industry. Victorious in elections at plants of West Virginia Rail Co. and Apollo Steel Co., association is trying to consolidate its forces for pending drives in largest units of the industry.

Running counter to NRA policies, Leon Henderson, chief of NRA Research and Planning Division, advocates keeping down industrial prices as means of attaining parity with agriculture and also fullest possible industrial activity as key to jobs for unemployed millions. Opposition also expressed to price and production control.

Large groups of industrial leaders attend conference with Federal Housing Administration officials as housing campaign gets under way.



Sept. 25 . . .

JOSEPH B. EASTMAN, Federal coordinator of transportation, in address at Atlantic City before National Petroleum Association, emphasizes importance to transportation and durable goods industries of development of light-weight equipment, demountable containers, etc.

Far-reaching reorganization of NRA expected to be announced soon by President.

Donald Richberg, in Baltimore address, raps industry for code intricacies and cites steel code as worst example. Richberg is Administration member of steel code.

PWA estimates its funds purchased \$80,000,000 worth of steel during PWA's first year, July, 1933, to July, 1934. Of total \$17,000,000 went for rails.



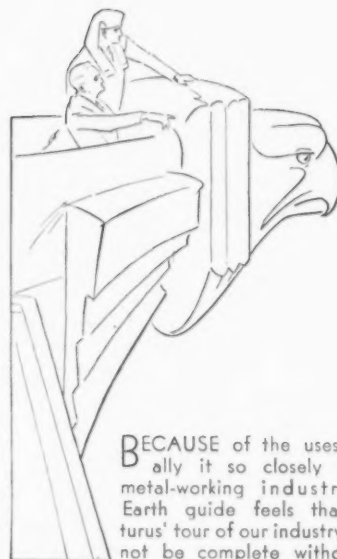
Oct. 2 . . .

NRA reorganized into five-man board, headed by S. Clay Williams, former president of Reynolds Tobacco Co., as era of General Johnson, dashing and fiery master of NRA as one ring circus, comes to an end. Major—or general—molting of Blue Eagle at first gives industry concern lest it indicate a left turn. President takes more direct guidance of organization than heretofore.

General rail rate increase hearings begun before Interstate Commerce Commission. Ten per cent advance in iron and steel rates, included in petition for boost, asked to raise additional revenue of \$170,000,000 annually.

Donald Richberg, made director of National Emergency Council, and charged with coordinating alphabetical soup agencies and acting in advisory capacity to them, tells National Press Club that no sweeping departure in policy will be made by newly created National Industrial Recovery Board without giving business an opportunity to be heard. Nevertheless indications appear of easing up on price and production control provisions in codes.

W. Ames & Co., Jersey City, N. J., makers of concrete reinforcing bars, spikes, railroad track supplies, etc., attack constitutionality of NRA in suit filed in Supreme Court of District of Columbia and challenge legality of Presi-



BECAUSE of the uses which ally it so closely to the metal-working industry, the Earth guide feels that Arc-turus' tour of our industry would not be complete without the inclusion of plastic molding. Thus, he shows him this seeming miracle of chemical research; the finding of an adaptable medium which "freezes" with heat. Hardwood forests as well as coal mines contribute their quotas to the phenol-aldehyde resins which are to become durable and colorful products of industry, via the manipulation of the plastic forming press. Die-making, too, enters this art, giving intricate and accurate form to that which formerly was wood and coal.

dential order barring use of Federal funds for purchase of products other than those meeting all requirements of codes.

Contrary to fear of left turn in NRA, it actually detours to the right. Prominent business men are recalled to its staff to assist in shaping policies as general New Deal policies of more conservative nature appear, leaving impression of greater cooperation between Administration and business after election. However, quick changes in policies have been so common as to cause industry to accept changes with reservations. Chairman Williams at press conferences says "glamorous and spectacular era" of NRA is at an end. Donald Richberg tells board of American Iron and Steel Institute in New York that no changes in steel code which would affect prices are being considered, thus allaying fear that all price provisions would be removed from codes.

Poor Richard's Almanac (Continued)



Oct. 23 . . .

PRESIDENT ROOSEVELT holds conferences with prominent industrial and financial leaders, thus inspiring reports that he is seeking to restore confidence and start vigorous upswing toward recovery. Conferences, begun at Hyde Park, continued at White House. Among those called into conference are Myron C. Taylor, chairman, United States Steel Corp.; Owen D. Young, chairman, General Electric Co., and William R. Grace, prominent ship owner.

Secretary of State Cordell Hull, in blunt statement, serves notice United States will not engage in tariff bargaining with countries which kite duties for purpose of gaining advantages in such bargaining.

Oct. 30 . . .

RETURNING from annual convention of American Federation of Labor in San Francisco, President William Green at meeting in Washington of NRA Labor Advisory Board, of which he acts as chairman, makes clear that organized labor will intensify drive for 30-hr. week, recognition on code authorities, greater recognition on National Industrial Recovery Board and strengthening of collective bargaining section of Recovery act.

Nov. 6 . . .

NRA and Federal Trade Commission preparing elaborate data on basing point system in iron and steel industry, as required by Presidential order. Though supposed to be "joint study," evidence indicates two Government bodies reflect widely different views on much-investigated subject.

Extension by President of automobile code until Feb. 1 without change, marks defeat for organized labor.

Amalgamated Association of Iron, Steel and Tin Workers files additional complaints with National Steel Labor Relations Board against steel companies.

Steel industry sticks to code prices in bidding on Navy steel.

Nov. 13 . . .

NEW Deal victory at November election is so overwhelming that it is embarrassing, putting into office most radical Congress in American history and raising doubts as to ability of President to stem wild legislative jamboree.

Nov. 20 . . .

NATIONAL Steel Labor Relations Board still delays decisions on hearings as it strives for truce between organized labor and steel industry. President Green of American Federation of Labor calls President Tighe of Amalgamated association to Washington, former evidently in more militant mood than latter, as reports are circulated Amalgamated is favorable to and Green is opposed to industry's offer to recognize and deal with union leaders without signing union contracts or depriving non-union workers of representation.

Nov. 27 . . .

INDICATION points to coolness of White House toward President Green of American Federation of Labor because of latter's insisting upon recognition of A.F. of L. demands made at San Francisco convention, and other activities. Federation, having broken plans for truce with steel industry, prepares to step up efforts for industry's unionization.

Tax exemption for stimulating modernization of plants as means of helping durable goods industries is considered but meets cool reception at Bureau of Internal Revenue.

NRA authorizes immediate decentralization of field forces in further effort to bring about enforcement.

Dec. 4 . . .

TEST to determine whether majority has exclusive right to bargain collectively for all employees in a plant is brought nearer by filing of Government suit at Buffalo against Houde Engineering Corpn.

Federal Trade Commission and NRA complete reports on basing point system in iron and steel industry. Reflecting widely different views, commission report goes to White House while NRA holds its report pending determination of President upon return to Washington.

Dec. 11 . . .

TESTIMONY as to character of Carnegie Steel Co.'s manufacturing operations is taken before National Steel Labor Relations Board in Washington preparatory to board's decision on petitions of Amalgamated Association of Iron, Steel and Tin Workers for elections at McDonald, Ohio, and Duquesne, Pa., plants. L. H. Burnett, vice-president of company, testifies as to intrastate character of company's business, while R. E. Desvernine, attorney for the company, files amended special appearances, again denying jurisdiction of board on ground company has not refused to meet and collectively bargain with employees, that no individual employees appear as petitioners and that election was held last June.

Iron and steel interests protest against higher rates on raw materials in general rail rate advance proposal, hearings on which have just ended.

Dec. 18 . . .

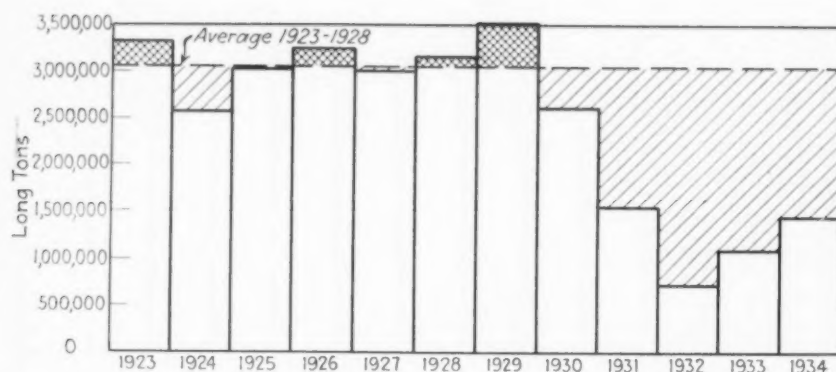
IN effort to break deadlock between steel industry and organized labor, President holds conference at White House at which steel executives, labor representatives and Government officials discuss "formula" for six-months' truce. No decision reached. White House statement says further conferences will be held.

National Industrial Recovery Board dusts off the goldfish bowl and in Santa Claus-like spirit announces it will begin series of open hearings Jan. 9 on code provisions, the first to deal with price fixing and price control. Indications are price clauses will be either greatly modified or entirely eliminated from many codes.

Huge Latent Demand for Durable Goods Is Key to Recovery

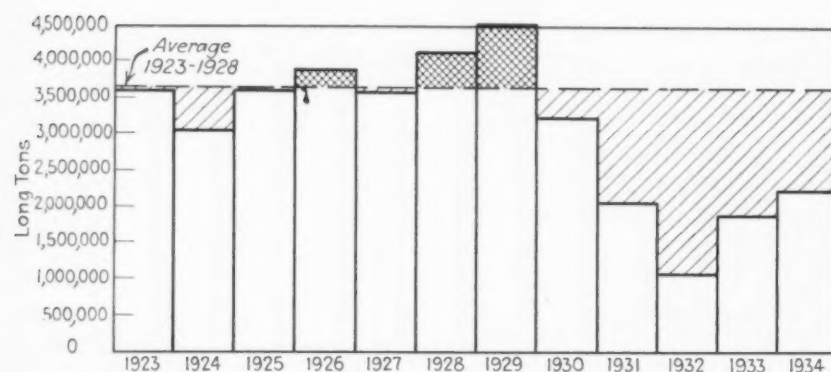
By DR. FREDERIC DEWHURST

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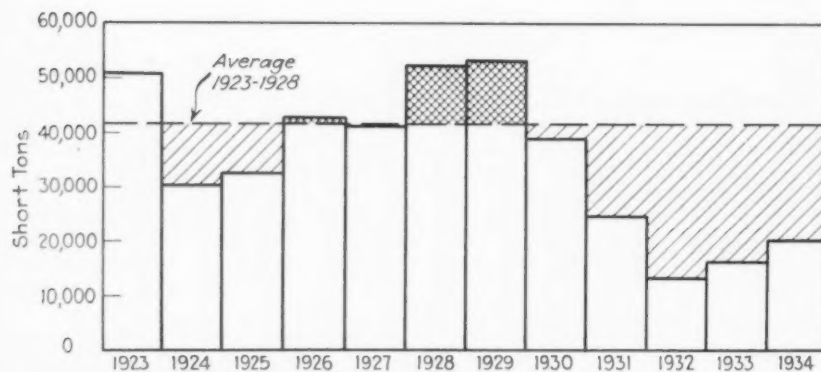
Pig Iron Production (Monthly Averages)

Pig iron production comprises practically the entire United States output, except that made with charcoal. Compiled by THE IRON AGE.



Steel Ingot Production (Monthly Averages)

Based on reports from companies representing about 94 or 95 per cent of the total production, computations to 100 per cent being made by the American Iron and Steel Institute.



Fabricated Steel Plate—New Orders (Monthly Averages)

Includes oil storage tanks, refinery, tank cars, gas holders, blast furnaces, etc. Figures compiled by the United States Bureau of the Census from reports of members of the American Erectors' Association and other large fabricators.

THERE is now almost universal realization that the key problem of recovery is the revival of the construction and other durable goods industries. Demand for the products of these industries is highly elastic, not only because their durability makes it possible to defer their replacement almost indefinitely, but because their purchase usually necessitates long-term financing and depends on a rising rate of corporate profits. As a result these industries fluctuate much more violently from boom to depression than the industries producing food, clothing and other necessities of daily consumption which are purchased in fairly steady volume during good times and bad.

Greatest Unemployment in Durable Goods Industry

The present depression has been no exception. Activity in the heavy industries as a whole fell to as low as 25 per cent of normal volume during the worst year of the depression, while production of consumption goods has at no time fallen below 75 per cent of the pre-depression volume. Unemployment has been correspondingly severe in the heavy industries. In normal times nearly as many workers are engaged in making durable goods as are employed in producing consumers' goods. At the present time, however, about 4,500,000 persons, or fully 40 per cent of those usually at work in the former industries, are unemployed, as compared with only 1,300,000 out of work in the latter industries.

How rapidly recovery in the heavy industries will get under way and how far it can proceed without interruption, obviously no one can predict until Government monetary and

budgetary policies are clarified and private capital markets have commenced to show signs of life. Five years of deferred maintenance and replacement, however, have resulted in an accumulated shortage of durable goods of imposing proportions which will have to be made up eventually. Moreover, there are encouraging indications that many of the heavy industries have already "turned the corner" and have gradually expanded operations during the past two years.

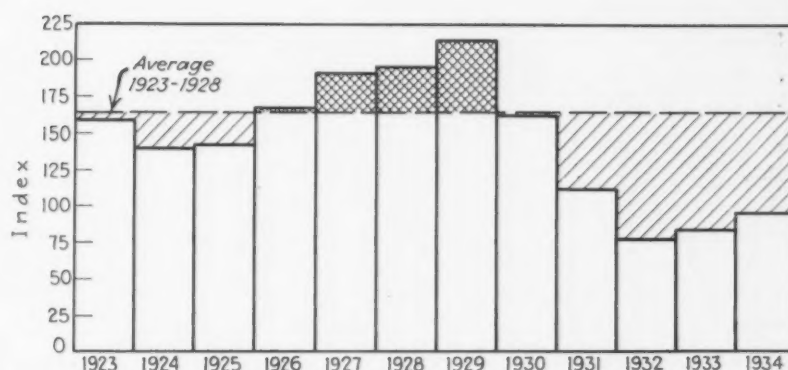
Large Accumulation of Deferred Needs

The accompanying charts show the trend of operations in a number of representative heavy industries during the five depression years as compared with the period of prosperity preceding the collapse. In each chart the height of the vertical bars measures the average monthly rate of operations for the year indicated, with averages for the first nine months used for the year 1934. The horizontal dotted line drawn across the upper part of each chart shows the average monthly rate of operations during the relatively stable and normal period of activity preceding, but not including, the boom year, 1929. Heavily shaded areas above this average line measure the extent by which operations exceeded this assumed "normal" rate, while the lightly shaded areas below the average show the extent of deficiency or shortage during years of sub-normal activity.

Although 1934 operations furnished no cause for rejoicing among the manufacturers of machinery and equipment, it is significant that, with only one exception among the industries studied, last year's volume of business was noticeably above the lowest levels of the depression. The year 1932 marked the low point for nine of the eleven products charted, with an increase in 1933 and a further gain in 1934. Shipments of cast iron boilers fell off slightly from 1932 to 1933, but increased noticeably last year. The only exception to the recent upward trend is in residential construction, where contracts awarded have continued to decline slightly during the past two years and were at a record low level in 1934.

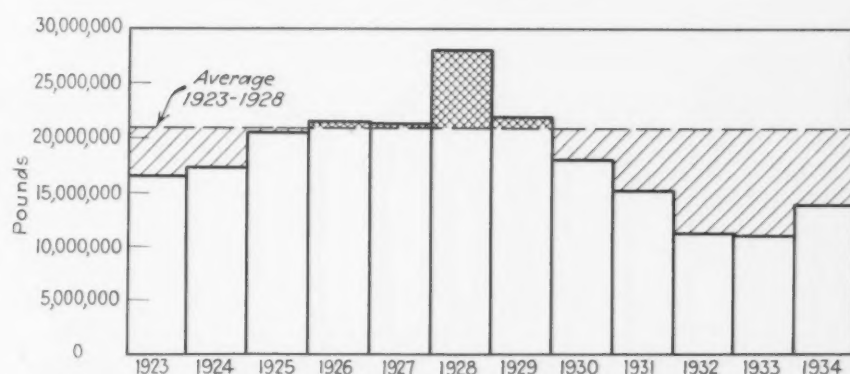
Residential Construction Makes Worst Showing

In the tabulation below, 1932 and 1934 operations in each industry are



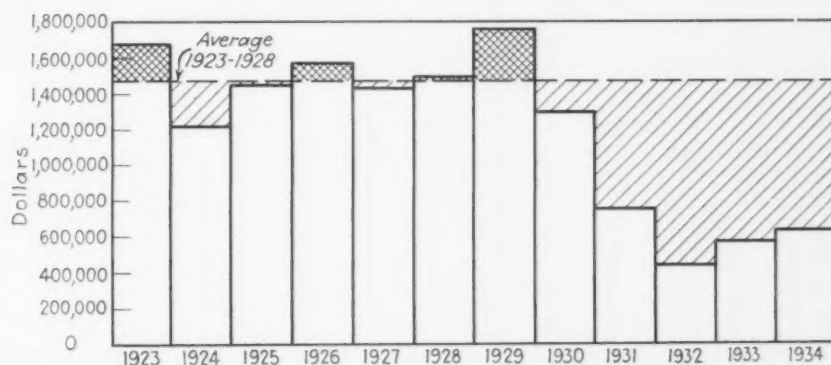
Iron, Steel and Heavy Hardware—Sales
(Monthly Averages of Index Numbers: January, 1921 = 100)

Based on reports from about 75 jobbing firms representing about 10 per cent of entire jobbing trade in iron, steel, motor accessories, and other heavy hardware. Compiled by American Steel Warehouse Association.



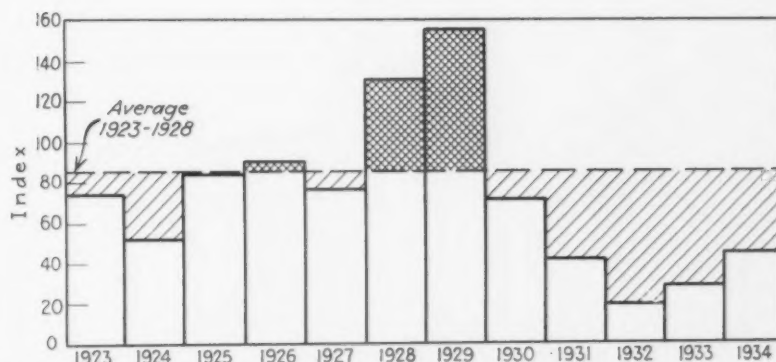
Cast Iron Square Boilers—Shipments (Monthly Averages)

Based on reports from firms representing over 90 per cent of the industry. Compiled by the Institute of Boiler and Radiator Manufacturers.



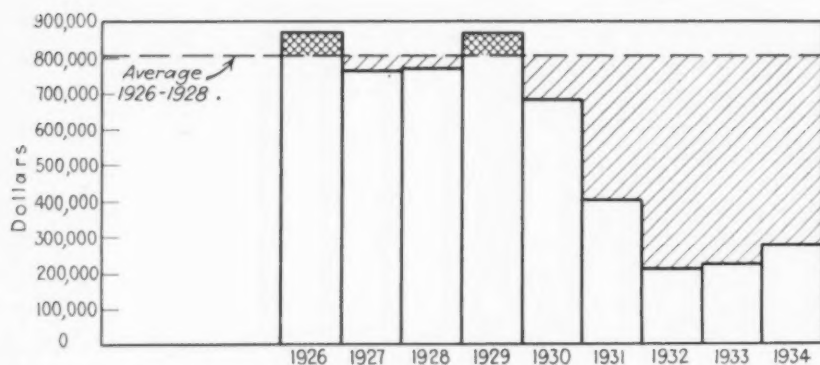
Steam Power, and Centrifugal Pumps—New Orders (Monthly Averages)

Figures represent about two-thirds of the industry. Compiled from data furnished by the Hydraulic Society.



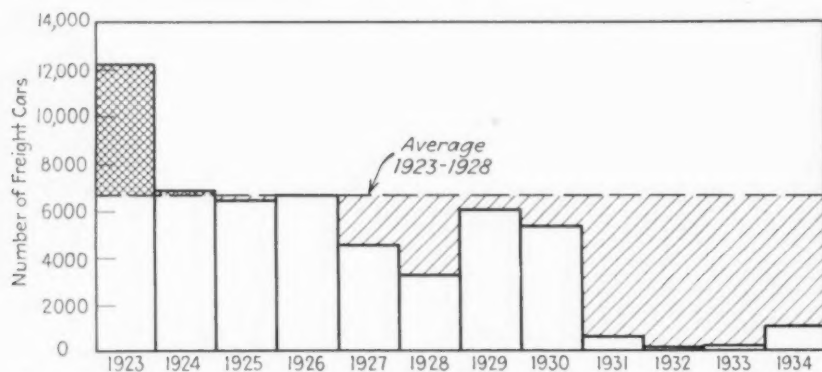
Machine Tools and Forging Machinery—Orders
(Monthly Averages of Index Numbers: 1926 = 100)

Represents bulk of production in industry. Compiled by the National Machine Tool Builders Association.



Electric Motors—Billings (Monthly Averages)

Includes large power direct-current electric motors from 1 to 200 hp.; built-in general-purpose motors, and frames including control equipment sold with motors. Compiled by National Electrical Manufacturers Association. Represents about 85 per cent of total output of these motors.



New Freight Cars—Shipments (Monthly Averages)

Data on shipments of equipment manufacturers obtained from the Interstate Commerce Commission.

compared with the average monthly rate during the years 1923 to 1928 expressed as 100 per cent:

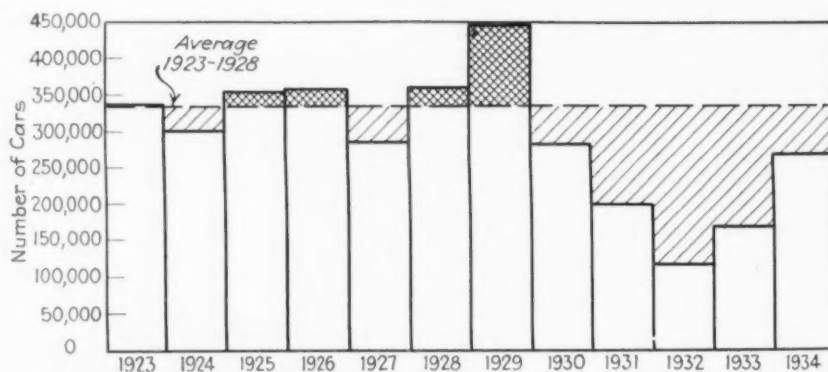
	Per Cent of 1923-28 Average	
	1932	1934
Pig iron.....	23.6	47.0
Steel ingots.....	29.7	61.3
Fabricated steel plate.....	32.3	48.6
Iron and steel heavy hardware.....	46.7	57.6
Cast iron boilers.....	54.4	67.1
Steam power and cent. pumps..	29.7	42.3
Machine tools and forging machinery.....	23.2	51.6
Electric motors.....	25.8	33.8
Freight cars.....	0.7	17.6
Automobiles.....	34.2	79.6
Residential buildings.....	13.7	12.4

The best and the worst records shown above are those of durable goods sold directly to the ultimate consumer. Automobile production rose in 1934 to nearly 80 per cent of the 1923-28 volume. But residential construction declined further to a level of only one-eighth of pre-depression volume, reflecting the continued prostration of the real estate market and the almost total lack of mortgage funds for new building.

(CONTINUED ON PAGE 282)

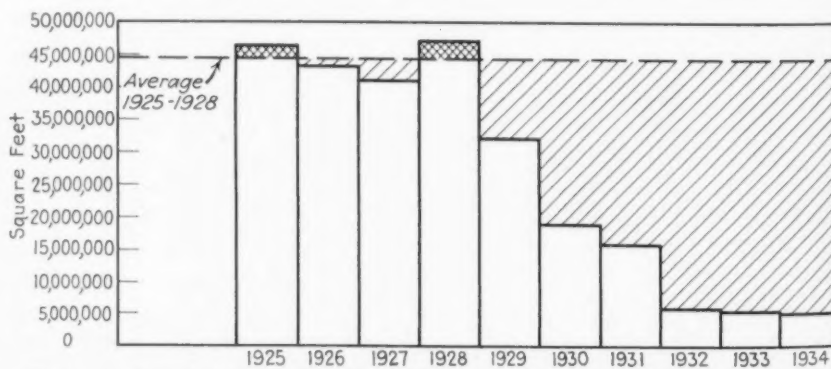


"THERE is an Earth man struggling with a serpent," exclaims Arcturus, as he sees this (to us) familiar scene. "It is not a serpent," his guide replies, "it is our servant air, and one of industry's most useful ones. Like electricity, we have harnessed it and put it to work to do things that would be beyond the power of human hands to do, except laboriously and with vast expenditure of precious time." It is hard for Arcturus to realize how air, the invisible, can be put to work, until he is shown the compressors which impart their energy to this flexible medium. Later on, he sees it drilling holes, driving rivets and performing many tasks for the metal-working industry.



Automobile Production (Monthly Averages)

Includes passenger cars, taxicabs, and trucks. Represents practically complete production or factory sales and foreign assemblies as compiled by the United States Bureau of the Census, in cooperation with the National Automobile Chamber of Commerce.



Contracts Awarded for Residential Buildings—Floor Space (Monthly Averages)

Includes one and two-family dwellings, apartments and hotels. Compiled by the F. W. Dodge Corp. from actual contract records in 37 States east of the Rocky Mountains. Estimated to represent about 91 per cent of total for United States.

Steel Industry Completes a 37 Per Cent Year

Steel Production in 1934 Shows a Gain of Only 12 Per Cent Over
1933—Earnings in Second Year of Code Are Also Disappointing

By G. L. LACHER

Managing Editor, The Iron Age

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THOSE who are scanning the records of 1934 for convincing evidences of business recovery will be disappointed by the performance of the iron and steel industry. Although production showed a gain, it was unimpressive as compared with the marked expansion of operations that occurred in the previous year. Whereas steel ingot production in 1933 rose 70 per cent above the depression low of 1932, raw steel output in 1934 registered an increase of less than 12 per cent over 1933.

Total ingot production for last year, including electric and crucible steel, was approximately 25,625,000 tons, or 37 per cent of capacity, as compared with 22,894,286 tons, or 33 per cent of capacity, in 1933, and 13,464,402 tons, or 19.7 per cent of capacity, in 1932.

The slow progress made in the ascent from nadir year of the depression is also apparent when one compares 1934 production with that of the record year 1929, when 54,850,-

433 tons of ingots was produced. The 1934 total was less than 47 per cent of 1929 output.

Recovery Act Causes Wide Fluctuations in Output

Although steel operations under the New Deal have had two spectacular upward surges, one in the summer of 1933, and the other in the late spring of 1934, neither of them brought the production rate above 60 per cent of capacity and both were followed by sharp reactions.

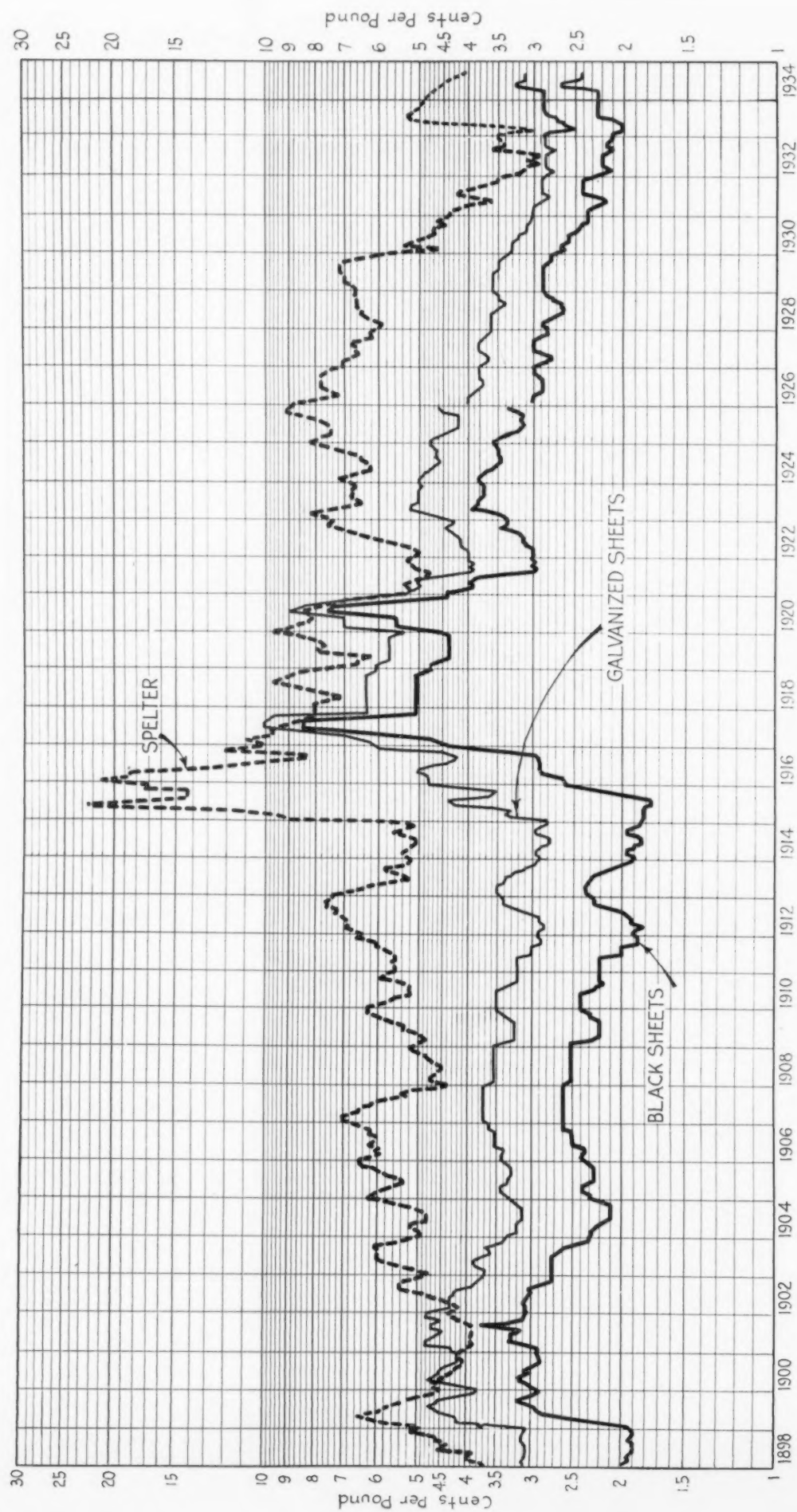
The erratic course of the operating curve, which contrasts sharply with the relatively steady rise of output in other leading steel producing nations, is directly attributable to the recovery program launched in this country in 1933. Abandonment of the gold standard, which aroused fears of inflation, was one of the first factors to stimulate purchases of iron and steel, but as time has gone on the monetary policy of the Administration has been of diminishing importance as a spur

to speculative buying, though it has continued to discourage capital investment.

The overshadowing influence in the iron and steel market has been the basic concept of the recovery act that business revival can be brought about by increasing labor's share in the fruits of production. Although industry as a whole is sympathetic with this aim, it was skeptical, from the first, of the means proposed to achieve it. The fixing of minimum wages, when the first codes were adopted, was generally conceded as essential to halt price competition that depended on wage exploitation, and shortening of hours, within limits, was accepted as a proper emergency method of spreading work. But men of industry recognized that the raising of wage rates and the cutting of working time might be carried to the point where demand would be stifled and employment would be destroyed rather than created. Industrialists also saw the danger in Section 7-a of

MONTHLY PRICES OF BLACK AND GALVANIZED SHEETS, AT PITTSBURGH, AND SPELTER, AT NEW YORK

(On No. 24 gage sheets since 1926 and No. 28 theretofore)



the recovery act, which, though intended to equalize the bargaining power of the individual workman in relation to his employer, actually has added to the power of no one except professional union leaders and has resulted in almost continuous industrial turmoil.

The Influence of Strikes

Strikes and threats of strikes, as well as repeated wage advances, have had a profound influence on steel production in the past two years. The knowledge that code adoption would raise wage costs and prices, together with the fear of inflation, precipitated the unusually large buying movement which drove steel production up to 58 per cent in July, 1933. The reaction from this upward surge was marked, causing output to fall to 27 per cent in November before a recovery set in again. Then labor disturbances which brought the automobile industry to the verge of a nation-wide strike operated as a deterrent influence. Finally with the preservation of industrial peace in that important sector of our economy, the steel industry in an effort to add its weight to the cause of harmony in employer-employee relations announced a 10 per cent advance in wages, effective April 1, which was the third wage boost since July, 1933. To compensate themselves for increased costs they raised prices \$2 to \$8 a ton, but in view of the time that elapsed between the first and final price filings customers had ample opportunity to place large protective orders at previous quotations. The amount of business driven in was exceptionally heavy and it was later expanded still further, particularly in tin plate and sheets, by the threat of a strike in the steel industry. The sponsoring union, the Amalgamated Association of Iron, Steel and Tin Workers, gave the steel mills until June 20 to accede to its ultimatum, but the walkout was finally prevented when a resolution was rushed through Congress which empowered the President to create a labor relations board for the iron and steel industry.

Rise in Production Yields Meager Earnings

As a result of the artificially stimulated spurt in the second quarter, steel ingot output for the first half of the year averaged 47 per cent. The net

Pig Iron Production Parallels Steel

PIG iron production in 1934 was 15,850,000 tons, according to year-end estimates, as compared with 13,213,000 tons in 1933, 8,686,000 tons in 1932 and 18,275,000 tons in 1931. Despite the improvement shown, 1934 output was only 37½ per cent of the 1929 record total of 42,286,000 tons.

return on the industry's capital investment, however, was less than 1 per cent. In view of this showing the price advances, which generally became effective July 1, were fully justified. However, even the higher price level would not insure profits unless business volume could be maintained, and when output took a nose dive with the completion of shipments against second quarter commitments producers attempted to stimulate purchases by scaling down the advances. This move, instead of winning the approval of the consuming trade, drew criticism, especially from those who had built up large inventories with borrowed money.

Prices and Production Decline

Price cuts failed to revive demand. Not only were buyers loaded with stocks but in many cases their consumption was reduced both by seasonal influences and by strikes. Among serious local industrial disturbances which choked the movement of iron and steel was the general strike in San Francisco. In September the nation-wide textile strike had an adverse effect on iron and steel demand.

The consequence of all these influences was a shrinkage of production to levels remindful of 1932. The ingot rate, which in May had reached 56.39 per cent and in June had averaged 52.68, fell to 26.75 per cent in July, to 22.93 per cent in August and to 22.74 per cent in September, the low of the year.

Buyers Wait Out the Market

The dire need of the mills for tonnage encouraged buyers to look for another general downward revision of prices and in many instances purchases were postponed even when holes began to appear in stocks. Users

of tin plate resorted to the cutting of stock material to desired sizes, taking the scrap loss rather than buy new plate at existing prices. Consumers of cold-rolled strip economized by buying cold-finished sheets and slitting them.

Presidential Order Unsettles the Market

This policy of watchful waiting was encouraged by the uncertain attitude of the Administration toward code prices, as well as by additional scattered price reductions filed with the steel code authority. On June 29 the President issued an order permitting the bidder on any Federal, State or municipal project to reduce prices to a maximum of 15 per cent from those filed with his code authority. It further provided that such bids would automatically become the official minimum prices on file with the code authority and would be extended to the trade generally. While the order was given various interpretations by NRA officials, it remained for the actual filing of bids on Navy work to demonstrate that it did not apply to steel prices.

Price cuts that followed the general downward revisions of July included a \$1 a ton cut on long ternes effective early in August, cuts of \$6 a ton on high-carbon spring wire and spoke wire and \$8 a ton on high-carbon basic wire announced early in November, and the filing of a new list of commodity prices early in October on forms of cold-rolled strip sold to the automobile industry. The last named prices, which were put in effect for fourth quarter only, pending a revision of extras, were intended as a temporary solution of the situation which made it economical for consumers to substitute cold-finished sheets for cold-rolled strips. Weakness in bolts and nuts, non-code products, contributed to market uncertainty. Late in September bolts and nut prices were reduced almost 20 per cent. In mid-October another cut was made.

The Richberg Scare

Business unsettlement was accentuated by an address delivered in October by Donald R. Richberg, No. 1 man of the Administration, in which he condemned price control. Among steel producers this threat of elimination of the code open price

policy caused grave concern. It was contended that such a step might result in a general collapse of the price structure in the absence of business revival, but it was pointed out that if prices were lowered wages would have to be cut also. It was recalled that, even under code prices, the stress of the times had forced steel companies to reduce the pay of salaried employees approximately 10 per cent.

Steady Rise in Output in Last Quarter

Subsequent unequivocal assurances from Mr. Richberg that no changes in the price provisions of the steel code were contemplated steadied the market and contributed much to the acceleration of the recovery in steel business which carried through until the end of the year.

Other influences which made for business betterment were increased demand from the automobile industry, farm equipment makers, tractor manufacturers and electric refrigerator plants. Sanitary ware plants, pipe mills and other purveyors to the building industry were aided in this period by the Government-sponsored home modernization campaign. A Federal meat packing program, under which cattle in drought-stricken areas were purchased and packed under Government auspices, gave support to the tin plate industry throughout the fall.

Scrap Prices Advance

By an odd coincidence steel output, which had shown a slow but uninterrupted gain since the first week in September, declined in the third week in October, when Administration policy was most doubtful. From that time on, however, each week showed a fresh increase and operations at the close of the year averaged close to 37 per cent of capacity. Scrap prices also rose steadily in the last two and one-half months of 1934. After remaining at the year's low of \$9.50 a ton for four weeks, THE IRON AGE scrap composite started an advance in the fourth week of October which was interrupted only once until the fourth week of December.

Iron and Steel Prices Fail to Keep Pace with Wages

Finished steel prices, as measured by THE IRON AGE composite, advanced only once during the year and part of this increase was canceled

before it could become effective on any material amount of tonnage. The net rise from 2.008c. to 2.124c. a lb., was \$2.32 a ton. The advance over the depression low of 1.867c., reached in April and May of 1933, was \$5.14 a ton. The current composite, however, is still \$3.86 a ton below the 1929 high of 2.317c. a lb.

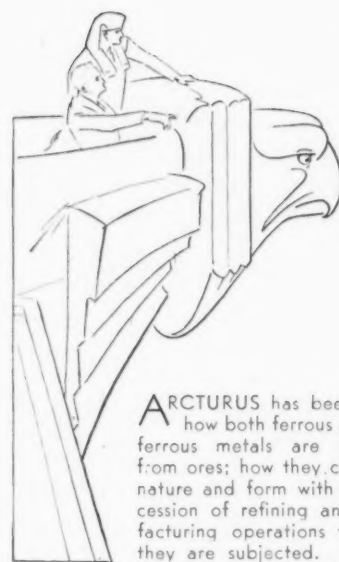
The record for pig iron is similar. THE IRON AGE pig iron composite rose from \$16.90 to \$17.90 a ton during 1934, which brought it \$4.34 a ton above the depression low of \$13.56, reached in December, 1932, and the first quarter of 1933. The present level is still 81c. a ton below the 1929 high of \$18.71.

This is in the face of the fact that the present level of wage rates in the iron and steel industry is 6 to 7 per cent higher than during the peak period in 1929.

Another Deficit Year

With the burden of higher labor costs and with swelling exports of scrap raising raw material costs, it is not surprising that the industry has not yet succeeded in breaking even. In the first nine months of 1934, seventeen companies representing 85 per cent of the country's capacity had a combined deficit of \$8,300,000, according to a survey made by the American Iron and Steel Institute. Estimates for the whole year made by Standard Statistics, Inc., indicate that 12 leading producers will show a net loss of \$21,850,000 as compared with a total deficit of \$66,560,000 in 1933.

It is possible that a much poorer showing would have been made without the code. The steel industry still has all too vivid a recollection of the competitive chaos that existed when secret price concessions were possible. Some mills have become restive at times under code restraints on their freedom of action and there are frequent complaints of the complexity of the many rules and regulations that now govern competitive practices. There are also occasional reports of adroit evasions of the code which, while not easy to prove or to meet, are sources of considerable vexation. Outright violations of the code are believed to be relatively few. Resale agreements have been difficult to enforce and on the Eastern seaboard a number of penalties have been assessed for violations by pipe jobbers. Effec-



ARCTURUS has been shown how both ferrous and non-ferrous metals are obtained from ores; how they change in nature and form with the succession of refining and manufacturing operations to which they are subjected. Now, as he gazes upon the art of electroplating, he sees, for the first time, what might be called the "marriage" of two different metals. And in each case he notes that the baser metal chooses a mate of more refinement. "We apply the same principle in our distant planet," says Arcturus, "as a eugenic measure of race improvement." And he is surprised to find out that such is not always the case on Earth.

tive control of the pipe jobbing trade has been complicated, however, by the existence of a number of non-code mills which sell the warehouse trade on any terms they see fit to make.

Revision of the Code

The code was renewed June 11 with a number of changes, among them the establishment of a basing point on bars and billets at Duluth, and basing points on wire rods at Youngstown, Anderson, Ind., Galveston, Tex., and San Francisco. At the same time assurances were given the Government that further deductions for water or motor transportation would be made when "equitable and necessary in order that competitive opportunity to producers and consumers shall be maintained." Subsequently a deduction of 60c. a ton was authorized on water and rail-and-water shipments of Southern pig iron to certain North Atlantic consuming points. This was in addition to the 38c. a ton differential under delivered prices from Northern furnaces which was already in effect. Demands for a Detroit base on sheets, strip and bars were not met, the Detroit zone system under which arbitrary deduc-

tions are made from delivered prices from Pittsburgh being retained. Nor was Youngstown made a basing point for sheets. Later, however, a resolution was adopted authorizing deductions of 7½¢. per 100 lb. from the freight rate from any basing point on sales of merchant bars, sheets and strip steel to various Mahoning Valley points and to Sharon and Sharpsville, Pa.

Among other changes made in the code on June 11 was a provision that prices might be filed regardless of cost. The prohibition against selling below cost in the original code had proved to be of mere theoretical importance as a restraint on price chiseling. No occasion had arisen to test the efficacy of the provision and in view of the accounting complexities involved in a controversy regarding costs it is doubtful whether punitive action would have been attempted except as a last resort.

Buyers Protected Against Price Advances

The most important revisions in the code were a provision permitting mills to meet the price reduction of a competitor as soon as it became effective instead of requiring them to wait 10 days after their own filings, and a prohibition of advances during a calendar quarter.

Thus, buyers were protected against further price increases once quotations were established for a quarter and, at the same time, were virtually assured the benefit of any reductions from the time the first downward revisions went into effect. These amendments largely destroyed the incentive to contract for iron and steel and probably were intended to serve as a further safeguard against speculative buying. However, one effect will be to intensify competition, since buyers not under contract will feel free to distribute tonnage as they see fit when needs arise. Orders will tend to become more numerous and selling costs will be proportionately increased. Similarly production costs will be raised, since backlogs in many cases yield operating economies of \$2 to \$3 a ton.

The "Big Bad Wolf" of the Code

The backlog consideration is an extremely important one, particularly with large steel manufacturers, and is

one of the main sources of dissatisfaction with the code. Doubtless powerful interests among producers would move toward a termination of the code but for one thing—fear of the bargaining power of the automobile industry, for years the "big bad wolf" of the iron and steel trade.

Despite the code prohibition of preferential prices to large buyers, the great power of the motor builders was felt throughout last year. A number of the price reductions made in 1934 are directly traceable to the pressure of the automobile makers. This influence also caused a small producer to petition the code authority for permission to set up a Detroit base on hot-rolled and cold-finished steel bars and cold-rolled strip steel.

From the first automobile builders have assailed the single price policy of the code. Early in 1934 the General Motors Corp. threatened to purchase a Cleveland mill. Protests from Michigan against the steel price advances announced in the second quarter were loud, and the steel industry was singled out as being to blame for increases in automobile retail prices. The mills countered by pointing out that the cost of steel in the average small motor car was only \$31.41, or 4.6 per cent of the total cost of the vehicle.

Ford Builds More Mills

But the tension between the two industries was not relieved and late in August the Ford Motor Co. placed contracts for new steel mills with sufficient capacity, according to the announcement, to permit the production of 3000 cars a day without "buying a pound of steel in the open market."

Basing Point System Attacked

The automobile industry's protests against the discontinuance of preferential steel prices to large purchasers contrasted sharply with charges made by members of Congress and various Government commissions and boards that the steel code oppressed small industries. The basing point system was a favorite object of attack, being roundly condemned both by the National Recovery Review Board, headed by Clarence Darrow, and by the Federal Trade Commission. The National Recovery Administration locked horns with these bodies and

made public an exceptionally able analysis of the basing point system, which was under the signature of R.W. Shannon, assistant deputy administrator. As an outcome of this clash the President authorized both the NRA and the Trade Commission to make further studies of the subject and to report to him late in the year. The reports have now been completed and are expected to be made public shortly.

Consumer Goods Lead as Sources of Tonnage

Among sources of steel demand, the automobile and container industries were outstanding in 1934, together taking 31 per cent of the finished steel production of the year. Automobile production in the United States and Canada, at 2,885,000 cars, showed a 45 per cent gain over 1933 and was more than twice the output of 1932. The automobile industry in 1934 took 21 per cent of all the finished steel produced, as against 19 per cent in 1933.

The container industry remained a large consumer although showing a decline, taking 10 per cent of the rolled steel made, as compared with 13½ per cent in 1933. Production of black plate for tinning in 1934 was 1,650,000 tons, compared with 1,964,000 tons in 1933.

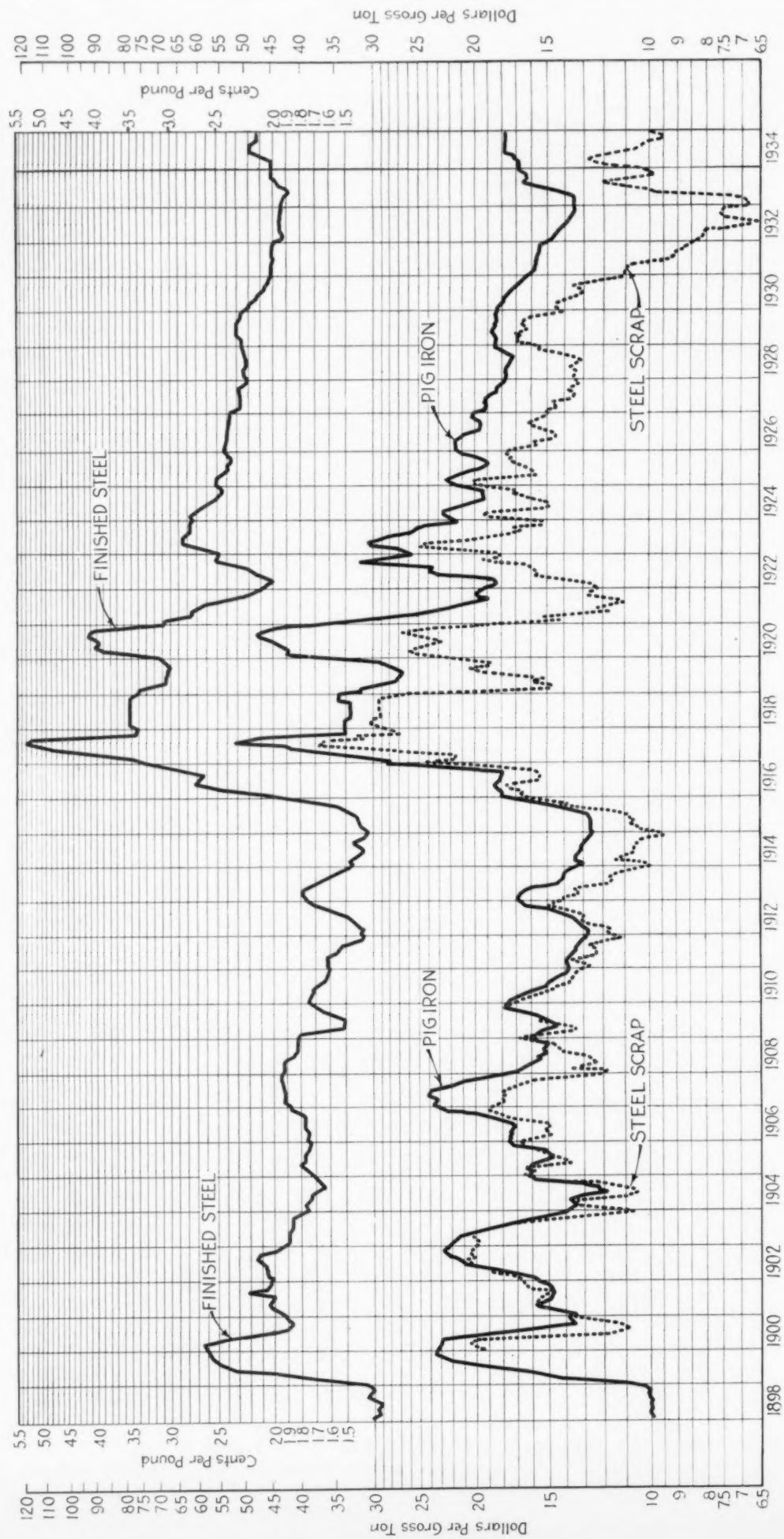
Tin Plate and Scrap Exports Conspicuous

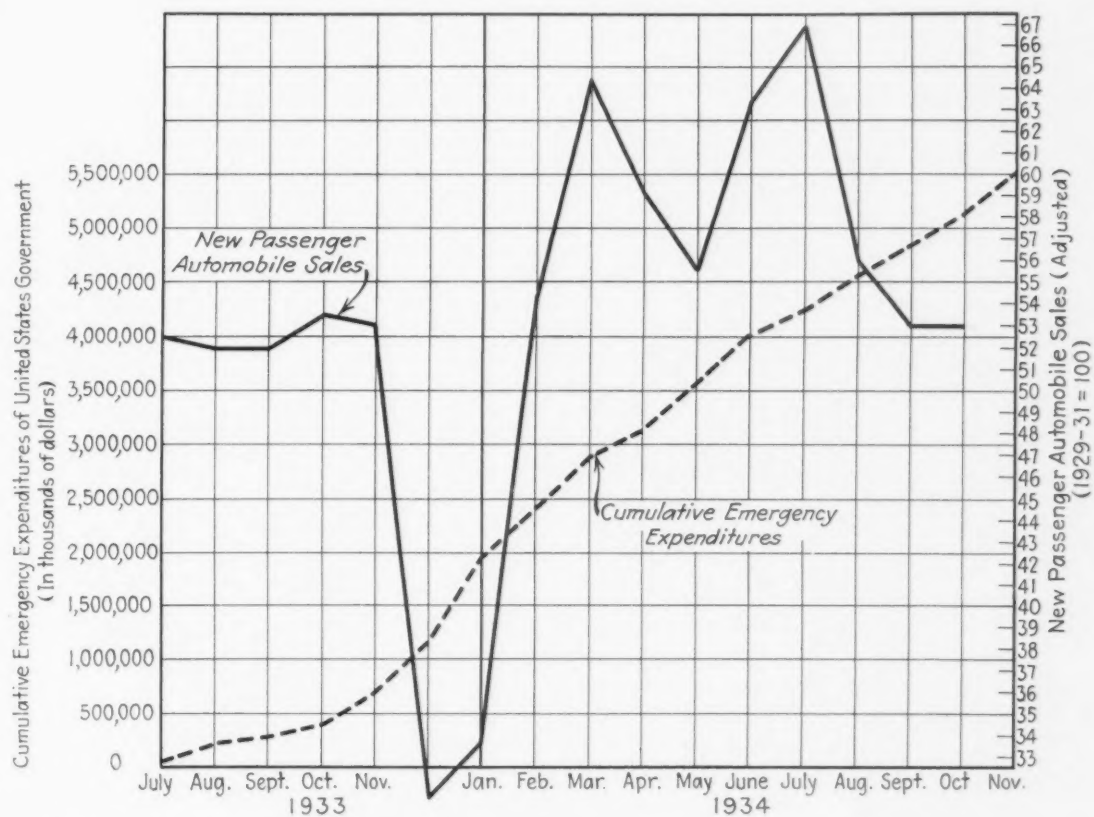
The share of exports last year was 4.4 per cent as against 3.5 per cent in 1933. Total outgoing shipments of rolled steel in the first 11 months of 1934 were 870,676 tons, compared with 457,563 tons in the previous year. Tin and terne plate was the largest export item among rolled steel products accounting for shipments of 166,700 tons as against 76,267 tons in the first 11 months of 1933.

The formation of an international pool had much to do with the stimulation of tin plate export. Price advances in the course of the year preparatory to the final establishment of pool quotations resulted in heavy anticipatory covering by foreign buyers. At the close of 1934 the American export price was approximately \$4.40 per base box, Pittsburgh, as compared

(CONTINUED ON PAGE 198)

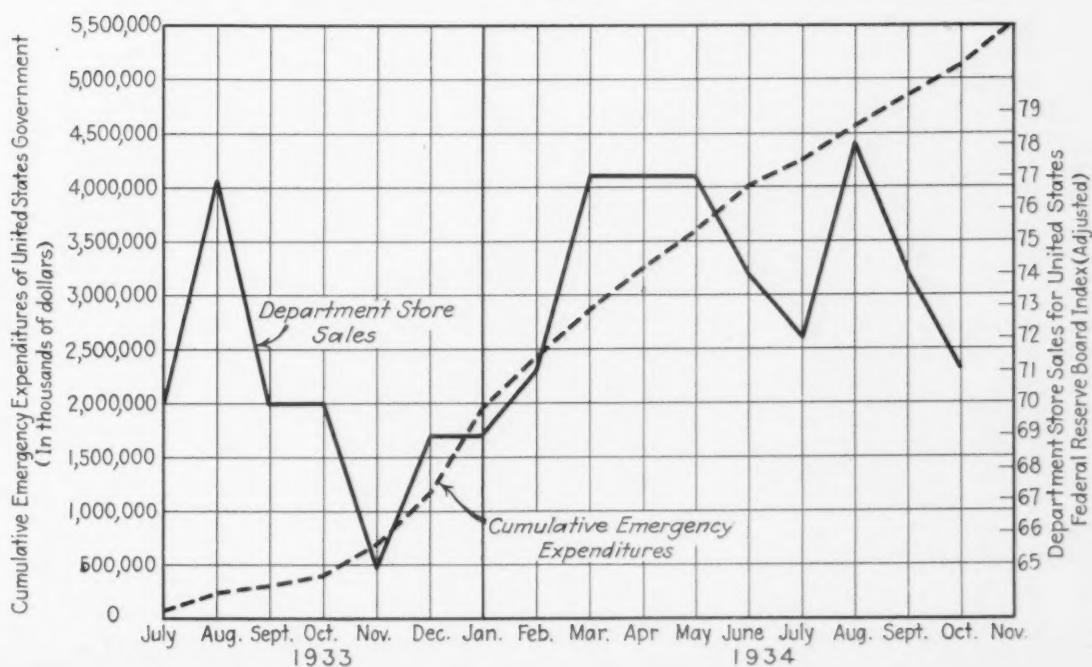
Composite Prices of The Iron Age





THE emergency expenditures of the Government have stimulated the sale of consumer goods. This is particularly noticeable in relation to automobile sales.

THE emergency expenditures of the Government in relation to department store sales (adjusted). The stimulating effect on buying is less evident in this case than it is in relation to automobile purchases.



with \$3.60 in April when negotiations for a world agreement were initiated.

By far the most conspicuous among iron and steel products exported in 1934 was scrap. Total scrap exports for the year are estimated at 1,900,000 tons, compared with 781,000 in 1933 and 515,000 tons in 1928, the previous high record.

Railroads Take More Steel

The railroads gave the iron and steel industry more support in 1934 than in the previous year, though most of their purchases were made possible by Government financing. The railroads' share of the finished steel produced in 1934 was 10.7 per cent as compared with 9 per cent in 1933. Rails shipped to carriers last year totaled 975,000 tons, compared with 416,000 tons in 1933. New freight cars installed on the railroads totaled 24,000 compared with 1874 in 1933. Fifty new steam locomotives and 35 new electric locomotives were put into service as against one steam in 1933. Passenger cars ordered numbered 363 as against only six in 1933.

Construction Volume Disappointing

The building industry took 13.4 per cent of the country's finished steel output in 1934, as compared with 11½ per cent in 1933. In this case also most of the work was financed by Government money. In the 11½ months ended with the middle of December, construction contracts in the 37 States east of the Rocky Mountains totaled \$1,493,426,900, of which \$938,447,500, or 63 per cent, was Government financed. The total for the 11½ months shows a moderate gain over the full year 1933, as well as 1932. In the 12 months of 1933, contracts totaled \$1,255,708,400; in 1932, they aggregated \$1,351,158,700.

Fabricated structural steel awards in 1934 are estimated at 1,057,489 tons, reflecting a gain of 14.6 per cent over 1933 and 10.7 per cent over 1932. The 1934 total, however, is only 29 per cent of the 1929 aggregate of 3,597,825 tons.

Quantity Extras on Plates and Shapes

Code accomplishments during the year included the compilation of freight tariffs on iron and steel products and a thorough-going revision of

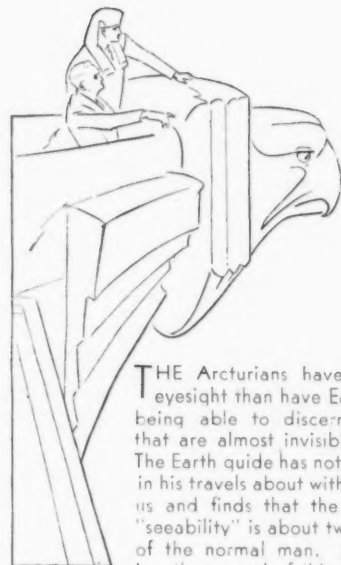
iron and steel extras. The freight tariffs covered water or water-and-rail rates to South Atlantic, Gulf and Pacific Coast ports and all-rail rates in the Official Classification and Southern Classification territories. The uniform extra book was revised effective Sept. 1 on sales of products for shipment on and after Oct. 1. It contained 408 pages, compared with 284 pages in the old extra book, and was prepared under the supervision of the American Iron and Steel Institute's commercial and technical committees. As a result of the efforts of the technical committee to work out a logical gradation of extras from the semi-finished material upward, relating charges to actual increases in costs, the new book represents a more logical arrangement of the material at hand and more uniform and consistent methods.

Among innovations in the extra book were new per 100-lb. quantity extras on plates, shapes and bars. Bars had previously had lump sum quantity extras, but shapes and plates had not previously been subjected to extra charges for quantity. Protests against the extras on plates and shapes were so strong that their effective date was twice postponed, the last time until March 1, 1935, on shipments after April 1.

New Fabrication-in-Transit Regulation

Structural steel fabricators also protested against code regulations No. 9, effective Oct. 10, 1934, which required structural plants buying steel for an identified structure to pay the full all-rail freight from basing point to place of erection at the time of shipment from the mill. Allowances for fabrication in transit, under this rule, can be paid by the mill to the fabricator only after the filing of an affidavit that the steel has been fabricated and shipped to the point of erection and the submission of bills of lading or, in the case of non-rail-road transportation, receipted freight bills covering the shipment.

The regulation was intended as a safeguard against purchases in excess of the actual requirements for an identified project, but was objected to as being too onerous. Protests were especially vigorous against the prepayment of freight to ultimate destination, which in many cases must



THE Arcturians have keener eyesight than have Earthmen, being able to discern things that are almost invisible to us. The Earth guide has noticed this in his travels about with Arcturus and finds that the visitor's "seeability" is about twice that of the normal man. Arcturus is rather proud of this superiority until his guide takes him to a research laboratory in which, through highly developed instruments, man is able to explore the invisible. Here, through modern microscopy, he sees the normal power of human vision intensified thousands of times, in the study of the structures of materials. "It is this ability to see into the invisible," says his guide, "that is the secret of our improvement of materials through research."

be made months before the completion of the job.

New Method of Quoting Boiler Tubes

Changes in marketing practices introduced under the code include the standardization of tool steels for sale according to chemical analysis instead of on a brand basis, and the placing of seamless and lapweld steel boiler tube prices on a per 100-ft. basis instead of a discount basis. The designation of lapweld steel boiler tubes was changed to "pressure" tubes, covering tubes for marine or stationary boilers, superheaters, cracking stills, locomotives, condensers, heat exchangers or evaporators, and tubing for refrigeration and air-conditioning equipment. There is now no separate schedule for lapweld steel locomotive tubes.

Among changes made late in the year was the elimination of quotations on stock tin plate, the prohibition of sales of rerolling billets except for rerolling purposes, and the placing of forging quality billets under 4 x 4 in. on a bar base.

WHERE STEEL WENT

Automotive Industry Increases Lead As Steel's Best Customer

*Distribution of Finished Steel in 1934 Also Indicates Large
Increases in Percentages Taken by the Railroads, and the
Building, Machinery and Agricultural Industries*

By T. H. GERKEN

News Editor, *The Iron Age*

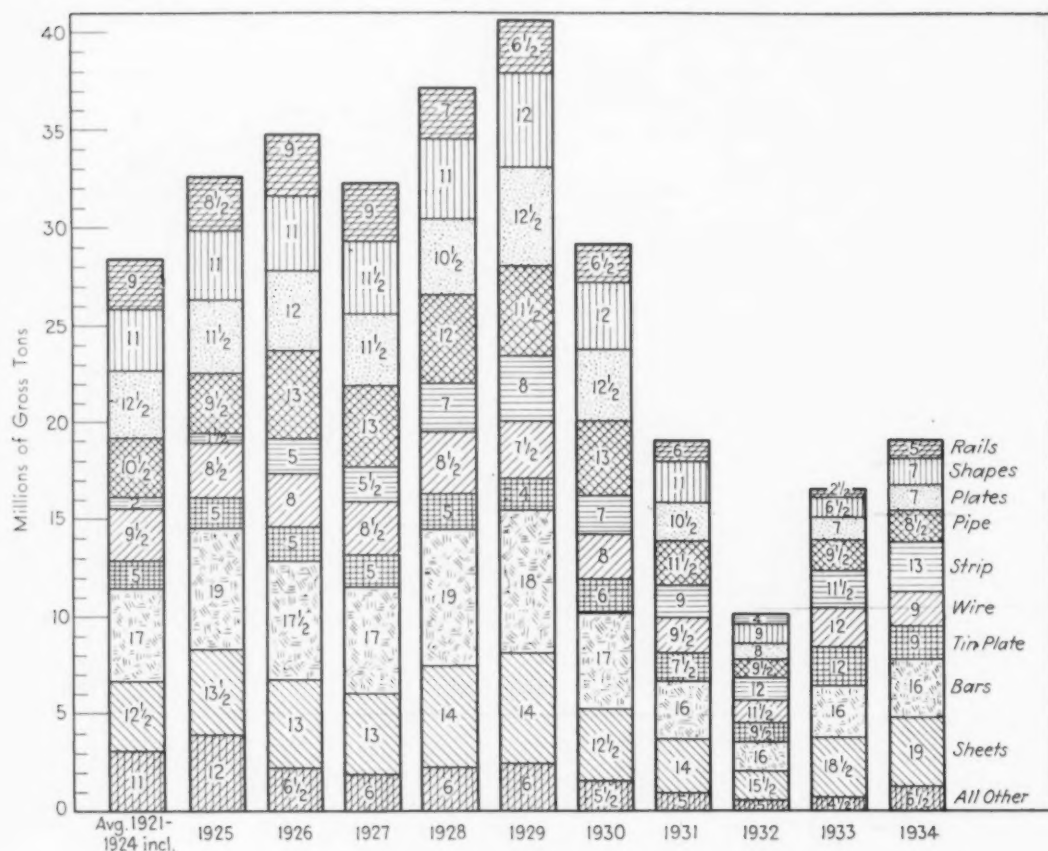
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THE steel industry's three best customers all contributed heavily to the gain in shipments in 1934, as compared to the preceding year, but the importance of the automobile industry reached record proportions. According to the annual survey by THE IRON AGE, 21 per cent of the finished steel consumed last year went into automobiles and trucks, while in 1933 that industry accounted for only 19 per cent.

Shipments of steel to the construc-

tion industry rose to approximately 2,550,000 tons, or 13½ per cent of the total, compared with 1,900,000 tons or 11½ per cent in the preceding year. The railroads took 2,050,000 tons in 1934 or 10½ per cent, after having fallen to 9 per cent in 1933, the lowest percentage ever recorded for this important consumer. Agriculture practically doubled its percentage of steel consumption in 1934, having taken 7½ per cent, as compared with 4 per cent in 1933.

A sharp decline was registered in the relative consumption of the container industry, which was the second largest steel customer in 1933. It accounted for only 10 per cent of last year's steel shipments, compared with 13½ per cent in 1933. A decline was also shown in shipments of steel to small miscellaneous users, who accounted for only 15½ per cent of the total in 1934. However, part of this decrease may be attributed to a more complete breakdown into major con-



Classification of finished steel output according to products in the last 13 years clearly reflects the increasing importance of light flat-rolled steel. The figures show the percentage attributable to each major form of steel and, prior to 1934, have been revised to conform with the official data compiled by the American Iron and Steel Institute.

Production of Finished Steel (Thousands of Gross Tons)

	Avg. for 1922 to 1924, Inc.		1925		1926		1927		1928		1929		1930		1931		1932		1933		1934	
	M. Tons	Per Cent	M. Tons	Per Cent	M. Tons	Per Cent	M. Tons	Per Cent	M. Tons	Per Cent	M. Tons	Per Cent	M. Tons	Per Cent	M. Tons	Per Cent	M. Tons	Per Cent	M. Tons	Per Cent	M. Tons	Per Cent
Rails	2,503	8.8	2,785	8.5	3,218	9.3	2,806	8.7	2,647	7.1	2,722	6.7	1,873	6.4	1,158	6.1	403	3.9	416	2.5	975	5.1
Plates	3,576	12.6	3,750	11.5	4,195	12.0	3,718	11.5	3,912	10.5	5,018	12.4	3,662	12.6	1,965	10.4	830	8.0	1,160	7.0	1,375	7.3
Black plate for tinning	1,394	4.9	1,632	5.0	1,762	5.1	1,657	5.1	1,792	4.8	1,699	4.2	1,692	5.8	1,431	7.5	1,000	9.7	1,964	11.8	1,650	8.7
Other sheets	3,522	12.4	4,384	13.4	4,561	13.1	4,245	13.1	5,296	14.2	5,716	14.1	3,713	12.8	2,642	13.9	1,613	15.6	3,084	18.6	3,675	19.4
Strips	2,750	9.7	2,844	8.7	1,222	3.5	1,318	4.1	2,161	5.8	2,503	6.2	1,941	6.7	1,620	8.5	1,185	11.4	1,929	11.6	2,450	12.9
Wire rods	2,750	9.7	2,844	8.7	2,722	7.8	2,770	8.5	3,080	8.3	3,134	7.7	2,347	8.0	1,844	9.7	1,186	11.4	2,024	12.2	1,700	8.9
Shapes	3,135	11.0	3,604	11.0	3,912	11.2	3,742	11.6	4,096	11.1	4,778	11.8	3,512	12.0	2,063	10.9	937	9.0	1,109	6.7	1,325	7.0
Bars, merchant	4,277	15.0	5,369	16.4	5,221	15.0	4,682	14.5	6,113	16.4	6,306	15.5	4,043	13.8	2,391	12.6	1,285	12.4	2,245	13.5	2,625	13.8
Bars, concrete	637	2.2	818	2.5	814	2.3	814	2.5	951	2.6	952	2.3	850	2.9	644	3.4	385	3.7	369	2.2	425	2.2
Pipe, skelp and tube rounds†	3,054	10.7	3,051	9.4	4,459	12.9	4,152	12.9	4,420	11.9	4,798	11.7	3,816	13.1	2,162	11.4	946	9.3	1,548	9.3	1,600	8.4
Hoops, bands, cotton ties*	510	1.8	560	1.7	544	1.5	499	1.5	559	1.5	586	1.4	126	0.4	113	0.6	80	0.8	*	..	*	..
Track accessories	627	2.3	781	2.4	915	2.6	828	2.6	750	2.0	889	2.2	590	2.0	385	2.0	147	1.4	200	1.2	400	2.1
Other finished products	2,433	8.6	3,081	9.5	1,273	3.7	1,103	3.4	1,400	3.8	1,532	3.8	1,032	3.5	569	3.0	355	3.4	557	3.4	800	4.2
Total	28,418		32,659		34,818		32,334		37,177		40,633		29,197		18,987		10,352		16,605		19,000	

*Included in strips.

†Tube rounds included since 1925.

suming groups by the companies contributing their figures to the survey.

The allocation of shipments to 11 important consuming groups, as shown in the accompanying table and chart, is based upon returns from 41 companies who turned out approximately 78½ per cent of the finished steel in 1934. Five other makers also furnished their tonnage data broken down into the major steel items and the production figures and chart shown are based upon returns from companies who made 88 per cent of the year's steel.

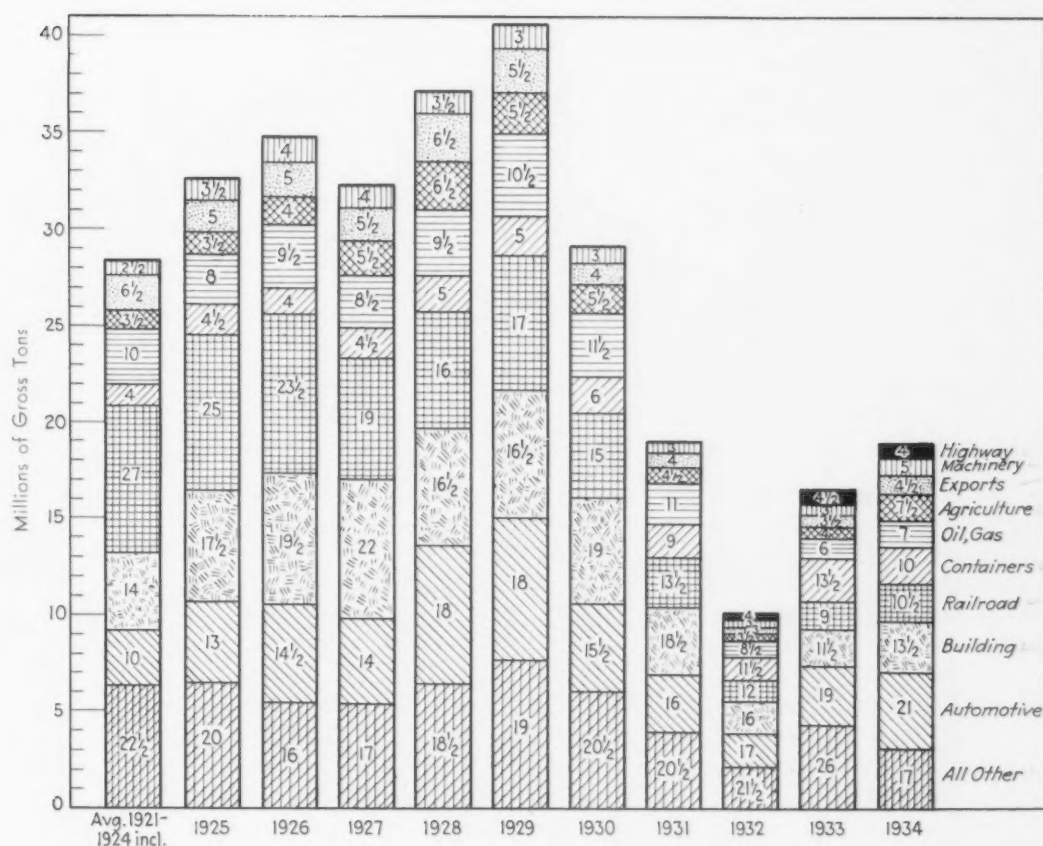
As in the two preceding years, light flat-rolled steel products constituted the bulk of 1934 output. Sheets, strips

Distribution of Rolled Steel in 1934, According to Shipments

Amount of Each Form (in Thousands of

	Rails	Track Accessories	Plates	Structural Shapes	Merchant Bars	Concrete Bars
Railroad cars and locomotives	6.2	193.6	88.0	114.2	0.3	0.3
Railroad buildings and bridges	0.1	0.4	14.2	94.6	4.6	5.0
Railroad track works	717.2	287.6	7.5	1.8	9.4	..
Fabricators and building contractors	0.6	0.2	197.1	530.2	82.8	109.0
Building trim companies	..	..	9.8	14.5	18.6	1.0
Furniture and stove makers	..	..	0.8	2.2	16.6	..
Highways and highway bridges	..	..	8.5	115.1	19.1	133.1
Auto. and parts makers	0.1	..	41.6	7.1	791.3	..
Oil, gas and water companies	0.8	0.1	101.2	23.4	7.9	2.5
Mining, quarrying and lumbering	18.2	7.1	19.4	7.8	6.9	0.2
Agriculture	0.2	..	14.2	37.9	254.6	..
Container makers	..	0.2	71.1	3.0	2.3	..
Ship and boat building	0.1	..	97.5	26.0	8.9	..
Machinery	1.7	0.1	58.6	31.5	92.9	..
Electrical manufacturers	..	..	14.8	3.7	11.8	..
Power developments	..	..	24.5	14.3	2.2	1.6
Bolt, nut and rivet makers	..	0.1	0.1	1.0	116.1	..
Jobbers and warehouses	6.2	9.3	66.0	101.0	150.6	46.1
Exports	55.5	8.6	37.7	40.0	40.1	10.3
Steel not otherwise classified	3.6	2.5	111.9	29.1	284.1	9.8
Totals	804.3	322.4	1,090.1	1,172.2	2,035.0	318.9
Undistributed according to consumers	170.7	73.6	105.2	84.7	195.2	34.3
Total indicated shipments	975.0	396.0	1,195.3	1,256.9	2,230.2	353.2

Distribution of finished steel according to consuming industries shows the decline in the importance of the railroads and the growing dominance of the automotive industry. The percentage taken by highways was included in the "All Other" classification prior to 1932 when this outlet reached important proportions.



Distribution of Finished Steel (Thousands of Gross Tons)

	Avg. for 1922 to 1924, Inc.		1925		1926		1927		1928		1929		1930		1931		1932		1933		1934	
	M.	Per	M.	Per	M.	Per	M.	Per	M.	Per	M.	Per	M.	Per	M.	Per	M.	Per	M.	Per	M.	Per
	Tons	Cent	Tons	Cent	Tons	Cent	Tons	Cent	Tons	Cent	Tons	Cent	Tons	Cent	Tons	Cent	Tons	Cent	Tons	Cent	Tons	Cent
Buildings	4,583	14.1	5,700	17.5	6,800	19.5	7,100	22.0	6,100	16.5	6,700	16.5	5,500	19.0	3,500	18.5	1,650	16.0	1,900	11.5	2,550	13.4
Railroads	7,333	26.8	8,200	25.0	8,200	23.5	6,100	19.0	6,000	16.0	6,900	17.0	4,400	15.0	2,550	13.5	1,250	12.0	1,500	9.0	2,050	10.7
Automotive	2,933	10.3	4,200	13.0	5,000	14.5	4,500	14.0	6,700	18.0	7,300	18.0	4,500	15.5	3,050	16.0	1,750	17.0	3,150	19.0	4,000	21.0
Oil, gas, mining	2,800	9.8	2,600	8.0	3,300	9.5	2,750	8.5	3,500	9.5	4,300	10.5	3,350	11.5	2,100	11.0	900	8.5	1,000	6.0	1,350	7.1
Metal containers	1,083	3.8	1,500	4.5	1,400	4.0	1,450	4.5	1,850	5.0	2,000	5.0	1,750	6.0	1,700	9.0	1,200	11.5	2,250	13.5	1,900	10.0
Agriculture	1,040	3.7	1,150	3.5	1,400	4.0	1,800	5.5	2,400	6.5	2,250	5.5	1,150	4.0	850	4.5	350	3.5	650	4.0	1,400	7.5
Shipbuilding																						
Machinery	637	2.3	1,150	3.5	1,400	4.0	1,300	4.0	1,300	3.5	1,200	3.0	900	3.0	600	3.0	300	3.0	500	3.0	925	4.9
Exports	1,800	6.4	1,650	5.0	1,750	5.0	1,800	5.5	2,400	6.5	2,250	5.5	1,600	5.5	750	4.0	300	3.0	550	3.5	835	4.4
Highways																						
Miscellaneous	6,183	22.8	6,500	20.0	5,600	16.0	5,500	17.0	6,900	18.5	7,700	19.0	6,000	20.5	3,900	20.5	2,100	20.5	4,175	25.0	2,940	15.4
Total	28,392		32,650		34,850		32,300		37,150		40,600		29,150		19,000		10,300		16,600		19,000	

of Companies Producing 78.5 Per Cent of the Year's Output

Gross Tons), Taken by Different Industries

Strips and Bands	Black Plate for Tinning	Galvanized Sheets	Other Sheets	Pipe and Tubing	Wire Products	Alloy Steel	All Other Finished Steel	Total All Finished
24.8	....	13.0	46.2	10.2	18.1	4.7	88.5	607.8
0.4	....	0.3	0.8	0.1	0.8	....	0.8	122.1
1.4	....	....	....	1.2	5.3	....	12.6	1,044.0
5.6	2.0	38.7	45.1	37.3	70.2	5.7	32.4	1,156.9
41.7	10.2	29.3	49.5	0.3	11.3	0.2	1.1	187.5
45.7	11.2	55.8	273.8	3.1	50.4	0.2	2.8	462.6
5.2	....	12.9	46.2	....	47.2	....	7.7	395.0
1,000.3	2.9	13.7	889.1	3.9	114.7	208.6	15.2	3,088.5
5.9	15.8	2.0	39.1	407.0	5.3	16.1	10.4	637.5
1.6	0.1	3.5	6.5	2.9	7.3	0.7	13.2	95.4
61.6	0.3	17.9	31.8	4.1	151.5	9.2	1.6	584.9
75.9	1,045.4	17.6	178.3	1.3	25.5	0.1	6.5	1,427.2
1.2	....	1.1	4.9	2.2	2.2	2.0	6.5	152.6
32.9	0.7	4.2	21.8	11.0	11.5	14.1	11.1	292.1
57.5	1.3	1.8	103.7	16.7	18.3	0.7	5.3	235.6
0.9	....	1.0	6.8	2.9	0.2	0.2	0.4	55.0
6.4	....	....	0.3	1.1	99.0	0.5	2.5	227.1
69.8	35.1	322.8	235.9	436.9	333.5	7.0	25.7	1,845.9
41.3	206.3	71.5	78.5	112.5	108.2	4.8	9.4	824.7
329.2	50.6	23.7	238.4	90.8	243.3	114.0	39.9	1,570.9
1,809.3	1,381.9	630.8	2,296.7	1,145.5	1,323.8	388.8	293.6	15,013.3
264.5	88.9	44.6	144.6	277.0	204.7	5.4	49.5	1,742.9
2,973.8	1,470.8	675.4	2,441.3	1,422.5	1,528.5	394.2	343.1	16,756.2

and tin plate, with 19, 13 and 10 per cent, respectively, accounted for 41 per cent of the year's total production, as compared with 42 per cent in 1933, and the loss was attributable entirely to tin plate. Indicated output of black plate for tinning last year was only 1,650,000 gross tons, compared with 1,964,000 tons in the previous year, and the loss was naturally reflected in reduced shipments to the container making group.

The percentage of steel going into rails more than doubled in 1934, although rail output is still well below its usual relative level of importance. Bars took the same percentage of steel in 1934 as in 1933 and other changes in relationship were of a minor character.

Trend Toward Automatic Control Seen in Open-Hearth Practice; Other Developments In 1934 in Making and Rolling Steel

IN the field of steel-making in 1934 increasing attention was paid to insulation of the open-hearth furnace, in whole or in part, and to installing control apparatus to convert the process toward the ultimate of automatic or semi-automatic operation. The year may also be said to represent a further shift toward looking upon steel-making as essentially a problem of physical chemistry. The one approach has been aimed at increasing economies and the other at a scientific handling of the numerous variables met with in steel-making.

A definite drift was more evident in 1934 away from empirical methods toward a codification of experience and toward a search for the elusive causes of occasional irregularities. A constantly rising standard of consumer quality has been a spur, but the steel producer on his own account became determined to ascertain the influence of very small amounts of elements whose presence hitherto has been regarded as inconsequential. As a result the year heard more of controlled steels, so called, and gave up information for the physical chemist respecting the effects of varying composition of furnace slags. The former item appears to be covered under the more easily understood classification of grain size.

In the matter of engineering data, THE IRON AGE was instrumental last year in publishing a considerable amount of information on the heat transmission of metallurgical and heating furnaces, as detailed in part later on in this review.

In the field of equipment, rapid strides were registered in the high frequency electric furnaces. Rolling mill equipment witnessed the development of three-high stands capable of

marked increases in output; and there was added use of single-stand reversing rolling of strip steel; also a new method of making seamless tubes.

Grain Size of Steel as a Purchasing Requirement

With no effort in this brief survey of the past year's happenings to delve into the metallurgical side, it must be said that the information brought out on grain size investigations was of prime importance to furnace operators. Steels of identical chemical composition but of different grain size behave differently in respect to machinability, in response to heat treatment and to carburizing and hardening; also they differ in capacity to resist distortion on hardening and in their creep behavior at elevated temperatures. Certification of grain size gained advocates in several quarters and this points to added control of the furnace operations to insure a product of closely predictable qualities. One dictum called for getting the non-metallic inclusions in a finely divided state uniformly distributed. The whole subject appears to need further clarification, but that a change is in the offing with regard to specifications for steel for a given service was indicated by observations made at the annual meeting in December of the American Society of Mechanical Engineers by Dr. John Johnston, head of the research organization of the United States Steel Corp'n. As special lecturer on that occasion, he made these noteworthy statements:

"Systematic scientific investigation in recent years is leading to a better control of the processes involved in the making and finishing of steel and thus to a better and more uniform product from day to day. This im-

proved uniformity of quality is a matter not so much of closely limited proportions of those elements commonly specified and analyzed for, as of control over the more elusive things which influence the useful behavior of the finished steel by affecting, for instance, the grain size of the solid steel. The better knowledge and control of these factors lead in turn to a better ability to select the steel best suited for any specified purpose and to the conclusions that the number of steel compositions now being specified and used is far greater than is really required, and that some at least of the acceptance tests commonly imposed on steel are less significant indications of its quality and fitness than is generally assumed."

Insulation and Automatic Control

What has been going on in open-hearth furnace insulation and in automatic or semi-automatic controls of the steel-making process was the subject of a special study instituted by THE IRON AGE late last year. The investigation has not yet been completed but enough information has been assembled to give preliminary findings. Of some 310 furnaces canvassed, roughly 45 per cent have some degree of insulation and 16 per cent have some form of automatic control. Insulation in most cases provides at least for the checkers, as might be expected, with slag pockets and up-takes below floor, and then up-takes above floor level, and finally flues and port ends with port roofs receiving insulation in the order named. However, roughly more than one-fifth of the insulated furnaces show applications to both front and back walls, 15 per cent cover insulated furnace roofs and 10 per cent include bottom insulation.

(CONTINUED ON PAGE 290)

SUMMARY OF THIS WEEK'S BUSINESS

Steel Production in Sharpest Increase in 12 Months

Ingot Output Advances From 36½ to 41 Per Cent of Capacity—
December Pig Iron Output in 4.6 Per Cent Rise

PRODUCTION of coke pig iron in December, according to returns to THE IRON AGE, totaled 1,034,983 tons or 33,387 tons a day as compared with 956,940 tons in November, or 31,898 tons daily. The gain in daily rate was 4.6 per cent. Sixty-eight furnaces were in blast Jan. 1, a net increase of eight since Dec. 1. Total output for the year was 15,918,549 tons, as compared with 13,212,785 tons for 1933, a gain of 20½ per cent.

IN both pig iron and steel output, recovery in this country has lagged behind that of other important producing nations. Pig iron production in the United States in 1934 was 38 per cent of the record total of 1929. Last year's pig iron output in Great Britain is estimated at 79 per cent of 1929 production. The corresponding ratio for Germany is approximately 66 per cent.

British production of steel ingots and castings in 1934, with December estimated, was nearly 93 per cent of 1929 output, while Germany's production was 72 per cent of 1929. The American outturn for the year, with the last month estimated, was only 46 per cent of the 1929 total.

TURNING from annual statistics to current developments, the situation in this country is more encouraging. Steel ingot output has risen to 41 per cent from 36½ per cent a week ago in the sharpest advance in more than 12 months. Production has risen 10 points to 80 per cent in the Wheeling district, nine points to 65 per cent in the Cleveland-Lorain area, nine points to 50 per cent in the Valleys, eight points to 45 per cent at Chicago, and one point each to 25 per cent at Pittsburgh and to 27 per cent in the Philadelphia district. Operations in other districts are substantially unchanged, with Detroit leading at 66 per cent.

Scrap prices, as measured by THE IRON AGE composite for heavy melting steel, have advanced from \$11.58 to \$11.75. This sensitive index has advanced every week save two since it left the year's low of \$9.50 in October. Scrap is particularly strong at Chicago, where heavy melting scrap has risen 50c. a ton, but has a softer tone at Pittsburgh.

THE dominant influence in the current increase in activity in iron and steel is the automotive industry, though farm equipment makers, textile machinery manufacturers and others are contributing to the bulge in mill bookings.

Ford's production at Rouge is now 5000 units a day and its January schedule calls for 110,000 motors. Ford's assemblies of commercial cars and trucks in December were the largest since June, 1930. Chrysler plans to produce 65,000 units in January and 90,000 in February.

Largely because of the upward surge of automobile production, the postponement of iron and steel purchases because of inventory taking has remained unnoticed. But among many buyers the year-end custom has been observed, especially in States which tax inventories. To escape such imposts considerable tonnage has been placed for shipment after Jan. 1.

IN a market which has so many encouraging indications, the labor situation alone is ominous. A decision of the steel labor board ordering elections in two Carnegie Steel Co. plants will, it is feared, precipitate a bitter controversy. The announcement that the executive council of the American Federation of Labor will convene late in January to consider a triple nation-wide strike in steel, automobile and textile industries is also a disturbing development.

Fabricated structural steel awards of 16,525 tons compared with 11,200 in the previous week. New projects total 17,225 tons as against 7400 a week ago. Structural steel contracts in December totaled 31,500 tons, compared with 64,025 tons in November and 54,230 tons in October.

The Army Ordnance Department has made further machine tool awards, raising its total purchases to \$1,600,000.

The Delaware, Lackawanna & Western has placed 4000 tons of 131-lb. rails and 3000 tons of fastenings. The Norfolk & Western has entered the market for 32,000 tons of 131-lb. rails. The Chesapeake & Ohio has bought 10 high-tensile steel hopper cars and has placed car repairs calling for 6000 tons of steel.

THE IRON AGE composite prices for pig iron and finished steel are unchanged at \$17.90 a ton and 2.124c. a lb. respectively.

▲▲▲ A Comparison of Prices ▲▲▲

Market Prices at Date, and One Week, One Month, and One Year Previous
Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron

	Dec. 31, 1934	Dec. 24, 1934	Dec. 4, 1934	Jan. 2, 1934
<i>Per Gross Ton:</i>				
No. 2 fdy., Philadelphia.....	\$20.26	\$20.26	\$20.26	\$19.26
No. 2, Valley furnace.....	18.50	18.50	18.50	17.50
No. 2 Southern, Cin'ti.....	19.13	19.13	19.13	18.13
No. 2, Birmingham.....	14.50	14.50	14.50	13.50
No. 2 foundry, Chicago*.....	18.50	18.50	18.50	17.50
Basic, del'd eastern Pa.....	19.76	19.76	19.76	18.76
Basic, Valley furnace.....	18.00	18.00	18.00	17.00
Valley Bessemer, del'd P'gh.....	20.76	20.76	20.76	19.76
Malleable, Chicago*.....	18.50	18.50	18.50	17.50
Malleable, Valley.....	18.50	18.50	18.50	17.50
L. S. charcoal, Chicago.....	24.04	24.04	24.04	23.54
Ferromanganese, seab'd car- lots.....	85.00	85.00	85.00	85.00

*This quotation is for delivery in South; in the North prices are 38c. a ton under delivered quotations from nearest Northern furnace.

*The switching charge for delivery to foundries in the Chicago district is 60c. per ton.

Rails, Billets, etc.

<i>Per Gross Ton:</i>				
Rails, heavy, at mill.....	\$36.37 1/2	\$36.37 1/2	\$36.37 1/2	\$36.37 1/2
Light rails, Pittsburgh.....	35.00	35.00	35.00	32.00
Re-rolling billets, Pittsburgh.....	27.00	27.00	27.00	26.00
Sheet bars, Pittsburgh.....	28.00	28.00	28.00	26.00
Slabs, Pittsburgh.....	27.00	27.00	27.00	26.00
Forging billets, Pittsburgh.....	32.00	32.00	32.00	31.00
Wire rods, Pittsburgh.....	38.00	38.00	38.00	36.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.....	1.70	1.70	1.70	1.60

Finished Steel

	Cents	Cents	Cents	Cents
<i>Per Lb.:</i>				
Bars, Pittsburgh.....	1.80	1.80	1.80	1.75
Bars, Chicago.....	1.85	1.85	1.85	1.80
Bars, Cleveland.....	1.85	1.85	1.85	1.80
Bars, New York.....	2.13	2.13	2.13	2.08
Plates, Pittsburgh.....	1.80	1.80	1.80	1.70
Plates, Chicago.....	1.85	1.85	1.85	1.75
Plates, New York.....	2.08	2.08	2.08	1.98
Structural shapes, Pittsburgh.....	1.80	1.80	1.80	1.70
Structural shapes, Chicago.....	1.85	1.85	1.85	1.75
Structural shapes, New York.....	2.05 1/4	2.05 1/4	2.05 1/4	1.95 1/4
Cold-finished bars, Pittsburgh.....	2.10	2.10	2.10	2.10
Hot-rolled strips, Pittsburgh.....	1.85	1.85	1.85	1.75
Cold-rolled strips, Pittsburgh.....	2.60	2.60	2.60	2.40

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables. †Blue Eagle copper.

Finished Steel

	Dec. 31, 1934	Dec. 24, 1934	Dec. 4, 1934	Jan. 2, 1934
<i>Per Lb.:</i>				
Hot-rolled annealed sheets, No. 24, Pittsburgh.....	2.40	2.40	2.40	2.25
Hot-rolled annealed sheets, No. 24, Gary.....	2.50	2.50	2.50	2.35
Sheets, galv., No. 24, P'gh.....	3.10	3.10	3.10	2.85
Sheets, galv., No. 24, Gary.....	3.20	3.20	3.20	2.95
Hot-rolled sheets, No. 10, P'gh.....	1.85	1.85	1.85	1.75
Hot-rolled sheets, No. 10, Gary.....	1.95	1.95	1.95	1.85
Wire nails, Pittsburgh.....	2.60	2.60	2.60	2.35
Wire nails, Chicago dist. mill.....	2.65	2.65	2.65	2.40
Plain wire, Pittsburgh.....	2.30	2.30	2.30	2.20
Plain wire, Chicago dist. mill.....	2.35	2.35	2.35	2.25
Barbed wire, galv., P'gh.....	3.00	3.00	3.00	2.85
Barbed wire, galv., Chicago dist. mill.....	3.05	3.05	3.05	2.90
Tin plate, 100 lb. box, P'gh.....	\$5.25	\$5.25	\$5.25	\$5.25

Scrap

<i>Per Gross Ton:</i>				
Heavy melting steel, P'gh.....	\$13.25	\$13.25	\$12.25	\$12.50
Heavy melting steel, Phila.....	10.75	10.75	10.75	11.50
Heavy melting steel, Ch'go.....	11.25	10.75	9.75	10.00
Carwheels, Chicago.....	11.50	11.50	10.00	10.00
Carwheels, Philadelphia.....	10.75	10.75	10.75	11.75
No. 1 cast, Pittsburgh.....	12.75	12.75	11.75	11.25
No. 1 cast, Philadelphia.....	11.00	11.00	11.00	12.50
No. 1 cast, Ch'go (net ton).....	10.25	10.00	8.50	9.50
No. 1 RR. wrot., Phila.....	11.25	11.25	11.25	11.00
No. 1 RR. wrot., Ch'go (net).....	10.00	9.75	8.75	8.75

Coke, Connellsville

<i>Per Net Ton at Oven:</i>				
Furnace coke, prompt.....	\$3.85	\$3.85	\$3.85	\$3.75
Foundry coke, prompt.....	4.60	4.60	4.60	4.25

Metals

	Cents	Cents	Cents	Cents
<i>Per Lb.:</i>				
Electrolytic copper, refinery.....	8.75	8.75	8.75	8.00
Lake copper, New York.....	9.12 1/2	9.12 1/2	9.12 1/2	8.25
Tin (Straits), New York.....	50.75	50.90	50.87 1/2	53.24
Zinc, East St. Louis.....	3.72 1/2	3.72 1/2	3.70	4.35
Zinc, New York.....	4.07 1/2	4.07 1/2	4.05	4.70
Lead, St. Louis.....	3.55	3.55	3.35	3.90
Lead, New York.....	3.70	3.70	3.50	4.00
Antimony (Asiatic), N. Y.....	13.87 1/2	13.75	13.75	7.25

▲▲▲ The Iron Age Composite Prices ▲▲▲

Finished Steel

Dec. 31, 1934.....	2.124c. a Lb.
One week ago.....	2.124c.
One month ago.....	2.124c.
One year ago.....	2.008

Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strips. These products make 85 per cent of the United States output.

	HIGH	Low
1934.....	2.199c., April 24;	2.008c., Jan. 2
1933.....	2.015c., Oct. 3;	1.867c., April 18
1932.....	1.977c., Oct. 4;	1.926c., Feb. 2
1931.....	2.037c., Jan. 13;	1.945c., Dec. 29
1930.....	2.273c., Jan. 7;	2.018c., Dec. 9
1929.....	2.317c., April 2;	2.273c., Oct. 29
1928.....	2.286c., Dec. 11;	2.217c., July 17
1927.....	2.402c., Jan. 4;	2.212c., Nov. 1

Pig Iron

\$17.90 a Gross Ton
17.90
17.90
16.90

Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

	HIGH	Low
1934.....	\$17.90, May 1;	\$16.90, Jan. 27
1933.....	16.90, Dec. 5;	13.56, Jan. 3
1932.....	14.81, Jan. 5;	13.56, Dec. 6
1931.....	15.90, Jan. 6;	14.79, Dec. 15
1930.....	18.21, Jan. 17;	15.90, Dec. 16
1929.....	18.71, May 14;	18.21, Dec. 17
1928.....	18.59, Nov. 27;	17.04, July 24
1927.....	19.71, Jan. 4;	17.54, Nov. 1

Steel Scrap

\$11.75 a Gross Ton
11.58
10.92
11.33

Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	HIGH	Low
1934.....	\$13.00, Mar. 13;	\$9.50, Sept. 25
1933.....	12.25, Aug. 8;	6.75, Jan. 3
1932.....	8.50, Jan. 12;	6.42, July 5
1931.....	11.33, Jan. 6;	8.50, Dec. 29
1930.....	15.00, Feb. 18;	11.25, Dec. 3
1929.....	17.58, Jan. 29;	14.08, Dec. 3
1928.....	16.50, Dec. 31;	13.08, July 2
1927.....	15.25, Jan. 11;	13.08, Nov. 22

Iron and Steel Scrap

PITTSBURGH

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	\$13.00 to \$13.50
No. 2 heavy melting steel	11.50 to 12.00
No. 2 railroad wrought	13.00 to 13.50
Scrap rails	13.00 to 13.50
Rails 3 ft. and under	14.50 to 15.00
Compressed sheet steel	12.75 to 13.25
Hand bundled sheet steel	11.50 to 12.00
Hvy. steel axle turnings	10.00 to 10.50
Machine shop turnings	8.50 to 9.00
Short shov. turnings	8.50 to 9.00
Short mixed borings and turnings	6.00 to 6.50
Cast iron borings	6.00 to 6.50
Cast iron carwheels	12.00 to 12.50
Heavy breakable cast	11.50 to 12.00
No. 1 cast	12.50 to 13.00
Railr. knuckles and couplers	14.50 to 15.00
Rail, coil and leaf springs	14.50 to 15.00
Roller steel wheels	14.50 to 15.00
Low phos. billet crops	15.00 to 15.50
Low phos. sheet bar crops	15.00 to 15.50
Low phos. plate scrap	13.50 to 14.00
Low phos. punchings	14.00 to 14.50
Steel car axles	14.00 to 14.50

CHICAGO

Delivered Chicago district consumers:
Per Gross Ton

Heavy melting steel	\$11.00 to \$11.50
Automobile hvy. melt, steel	10.50 to 11.00
Shoveling steel	11.00 to 11.50
Hydraulic comp. sheets	10.50 to 11.00
Drop forge flashings	10.00 to 10.50
No. 1 busheling	10.50 to 11.00
Roller carwheels	12.50 to 13.00
Railroad tires	12.50 to 13.00
Railroad leaf springs	12.50 to 13.00
Axle turnings	10.50 to 11.00
Steel couplers and knuckles	12.50 to 13.00
Coil springs	12.50 to 13.00
Axle turnings (elec. fur.)	11.00 to 11.50
Low phos. punchings	12.50 to 13.00
Low phos. plates, 12 in. and under	13.50 to 14.00
Cast iron borings	6.50 to 7.00
Short shoveling turnings	6.50 to 7.00
Machine shop turnings	5.50 to 6.00
Retolling rails	12.00 to 12.50
Steel rails, less than 3 ft.	13.00 to 13.50
Steel rails, less than 2 ft.	14.00 to 14.50
Angle bars, steel	12.00 to 12.50
Cast iron carwheels	11.50 to 12.00
Railroad malleable	13.00 to 13.50
Agricultural malleable	9.50 to 10.00

Per Net Ton

Iron car axles	\$15.50 to \$16.00
Steel car axles	16.00 to 16.50
No. 1 railroad wrought	10.00 to 10.50
No. 2 railroad wrought	9.75 to 10.25
No. 2 busheling	5.50 to 6.00
Locomotive tires, smooth	10.00 to 10.50
Pipe and flues	5.00 to 5.50
No. 1 machinery cast	10.25 to 10.75
Clean automobile cast	10.50 to 11.00
No. 1 railroad cast	9.00 to 9.50
No. 1 agricultural cast	8.50 to 9.00
Store plate	6.00 to 6.50
Grate bars	6.00 to 6.50
Brake shoes	6.75 to 7.25

PHILADELPHIA

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	\$10.50 to \$11.00
No. 2 heavy melting steel	9.50 to 10.00
No. 1 railroad wrought	11.00 to 11.50
Bundled sheets	9.00
Hydraulic compressed, new	10.00 to 10.50
Hydraulic compressed, old	6.50 to 7.00
Machine shop turnings	5.50 to 6.00
Heavy axle turnings	8.50 to 9.00
Cast borings	5.00 to 5.50
Heavy breakable cast	10.00 to 10.25
Store plate (steel works)	8.50 to 9.00
No. 1 low phos. heavy	15.00 to 15.50
Couplers and knuckles	14.00 to 14.50
Roller steel wheels	14.00 to 14.50
No. 1 blast furnace	5.00 to 5.50
Spec. iron and steel pipe	8.00
Shafting	16.50 to 17.00
Steel axles	16.50 to 17.00
No. 1 forge fire	9.00
Cast iron car wheels	11.50 to 12.00
No. 1 cast	10.50 to 11.50
Cast borings (chem.)	12.00 to 14.00
Steel rails for rolling	12.00

CINCINNATI

Dealers' buying prices per gross ton:

Heavy melting steel	\$8.25 to \$8.75
Scrap rails for melting	9.50 to 10.00
Loose sheet clippings	5.00 to 5.50
Bundled sheets	7.00 to 7.50
Cast iron borings	5.50 to 6.00
Machine shop turnings	5.50 to 6.00
No. 1 busheling	7.00 to 7.50
No. 2 busheling	3.75 to 4.25
Rails for rolling	10.00 to 10.50
No. 1 locomotive tires	9.50 to 10.00
Short rails	12.50 to 13.00
Cast iron carwheels	9.00 to 9.50
No. 1 machinery cast	10.25 to 10.75
No. 1 railroad cast	9.50 to 10.00
Burnt cast	7.00 to 7.50
Store plate	7.00 to 7.50
Agricultural malleable	9.00 to 9.50
Railroad malleable	9.25 to 9.75

CLEVELAND

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	\$10.00 to \$10.50
No. 2 heavy melting steel	9.50 to 10.00
Compressed sheet steel	10.00 to 10.50
Light bundled sheet stampings	7.50 to 8.00
Drop forge flashings	9.00 to 9.50
Machine shop turnings	6.50 to 7.00
Short shoveling turnings	7.00 to 7.50
No. 1 busheling	9.00 to 9.50
Steel axle turnings	9.00 to 9.50
Low phos. billet crops	14.00 to 14.50
Cast iron borings	7.00 to 7.50
Mixed borings and short turnings	7.00 to 7.50
No. 2 busheling	7.00 to 7.50
No. 1 cast	11.50 to 12.00
Railroad grate bars	7.00 to 7.50
Store plate	7.25 to 7.50
Rails under 3 ft.	14.50 to 15.00
Rails for rolling	15.50 to 16.00
Railroad malleable	11.50 to 12.00
Cast iron carwheels	12.00

BUFFALO

Per gross ton, f.o.b. Buffalo consumers' plants:

No. 1 heavy melting steel	\$10.50 to \$11.00
No. 2 heavy melting scrap	9.50 to 10.00
Scrap rails	10.50 to 11.00
New hydraulic, comp. sheets	9.50 to 10.00
Old hydraulic, comp. sheets	8.25 to 8.75
Drop forge flashings	9.50 to 10.00
No. 1 busheling	9.50 to 10.00
Hvy. steel axle turnings	7.00 to 7.50
Machine shop turnings	5.00 to 5.50
Knuckles and couplers	12.50 to 13.00
Coil and leaf springs	12.50 to 13.00
Roller steel wheels	12.50 to 13.00
Low phos. billet crops	12.25 to 12.75
Short shov. steel turnings	5.50 to 6.00
Short mixed borings and turnings	5.50 to 6.00
Cast iron borings	5.50 to 6.00
No. 2 busheling	6.00 to 6.50
Steel car axles	11.00 to 11.50
Iron axles	11.00 to 11.50
No. 1 machinery cast	11.50 to 12.00
No. 1 cupola cast	9.50 to 10.00
Store plate	9.25 to 9.75
Steel rails, 3 ft. and under	12.50 to 13.00
Cast iron carwheels	10.50 to 11.00
Industrial malleable	12.00 to 12.50
Railroad malleable	12.00 to 12.50
Chemical borings	7.00 to 7.50

BOSTON

Dealers' buying prices per gross ton:

*No. 1 heavy melting steel	\$8.25 to \$8.50
No. 1 heavy melting steel	7.00 to 7.25
Scrap T rails	7.00 to 7.25
*No. 2 steel	7.25 to 7.50
No. 2 steel	6.00 to 6.25
Breakable cast	6.00 to 6.50
Machine shop turnings	2.75 to 3.00
Bundled skeleton, long	5.50 to 5.75
Forge flashings	5.50 to 5.75
Shafting	11.50 to 12.00
Steel car axles	11.50 to 12.00
Cast iron borings, chemical	6.50 to 7.00
Store plate	4.00 to 4.25

Per gross ton delivered consumers' yards:

Textile cast	\$9.00 to \$9.50
No. 1 machinery cast	9.00 to 9.50
Store plate	6.00 to 6.50
Railroad malleable	11.00 to 11.50

* Delivered local army base.

NEW YORK

Dealers' buying prices per gross ton:

No. 1 heavy melting steel	*\$7.00 to \$8.50
No. 2 heavy melting steel	*\$5.50 to \$7.00
Heavy breakable cast	6.25 to 6.75
No. 1 machinery cast	7.25 to 7.75
No. 2 cast	6.50 to 7.00
Store plate	5.75 to 6.25
Steel car axles	12.50 to 13.00
No. 1 railroad wrought	7.50 to 8.00
No. 1 yard wrought, long	6.50 to 7.00
Spec. iron and steel pipe	4.50 to 5.00
Forge fire	5.50 to 6.00
Rails for rolling	9.00 to 9.50
Short shoveling turnings	2.50 to 3.00
Machine shop turnings	2.50 to 3.00
Cast borings	3.50 to 3.75
No. 1 blast furnace	2.00 to 2.50
Cast borings (chemical)	11.00 to 11.50
Unprepared yard iron and steel	4.00 to 4.50

Per gross ton, delivered local foundries:

No. 1 machinery cast	\$10.50
No. 1 hvy. cast (cupola size)	9.50

No. 2 cast 8.00

*For direct car loading only.
†Loading on barge.

BIRMINGHAM

Per gross ton delivered consumers' yards:

Heavy melting steel	\$9.00
Scrap steel rails	10.00
Short shoveling turnings	6.50
Store plates	6.50
Steel axles	10.00 to 10.50
Iron axles	10.00 to 10.50
No. 1 railroad wrought	6.50
Rails for rolling	11.00 to 12.00
No. 1 cast	9.50 to 10.00
Tramcar wheels	9.00 to 9.50
Cast iron borings, chem.	8.00

ST. LOUIS

Per gross ton delivered consumers' yards:

Selected heavy steel	\$9.00 to \$9.50
No. 1 heavy melting	8.00 to 8.50
No. 2 heavy melting	7.00 to 7.50
No. 1 locomotive tires	9.75 to 10.25
Misc. stand-sec. rails	9.50 to 10.00
Railroad springs	10.50 to 11.00
Bundled sheets	6.00 to 6.50
No. 2 railroad wrought	9.00 to 9.50
No. 1 busheling	5.00 to 5.50
Cast iron borings and shoveling turnings	2.50 to 3.00
Rails for rolling	11.00 to 11.50
Machine shop turnings	2.50 to 3.00
Heavy turnings	5.50 to 6.00
Steel car axles	13.50 to 14.00
Iron car axles	13.50 to 14.00
No. 1 railroad wrought	7.00 to 7.50
Steel rails less than 3 ft.	11.75 to 12.25
Steel angle bars	9.50 to 10.00
Cast iron carwheels	8.25 to 8.75
No. 1 machinery cast	8.50 to 9.00
Railroad malleable	10.00 to 10.50
No. 1 railroad cast	8.50 to 9.00
Store plate	6.50 to 7.00
Agricult. malleable	8.50 to 9.00

DETROIT

Dealers' buying prices per gross ton:

Heavy melting steel	\$8.50 to \$9.00
Borings and short turnings	5.25 to 5.75
Long turnings	\$4.50 to \$5.00
No. 1 machinery cast	10.00 to 10.50
Automotive cast	10.50 to 11.00
Hydraulic, comp. sheets	9.50 to 10.00
Store plate	6.25 to 6.75
New factory busheling	7.50 to 8.00
Old No. 2 busheling	4.50 to 5.00
Sheet clippings	5.50 to 6.00
Flashings	7.50 to 8.00
Low phos. plate scrap	9.25 to 9.75

CANADA

Dealers' buying prices per gross ton:

Toronto Montreal	
Heavy melting steel	\$5.50 to \$5.50
Rails scrap	6.00 to 6.50
Machine shop turnings	2.50 to 2.50
Roller plate	4.50 to 4.50
Heavy axle turnings	2.50 to 2.50
Cast borings	3.00 to 3.00
Steel borings	2.00 to 2.00
Wrought pipe	2.50 to 2.50
Steel axles	4.50 to 6.00
Axles wrought iron	4.50 to 6.50
No. 1 machinery cast	7.75 to 9.00
Store plate	4.50 to 5.00
Standard carwheels	7.25 to 7.50
Malleable	6.75 to 7.00

Cast Iron Pipe

Westfield, Mass., closed bids Dec. 28 on 120 tons of 12-in. Warren Foundry & Pipe Corp. was low bidder on spun pipe, and United States Pipe & Foundry Co. low on pit cast.

Thorsby, Ala., asks bids until Jan. 7 for 1120 ft. 8-in. and 13,175 ft. 2-in., for water supply; also for 60,000-gal. steel tank on 120-ft. steel tower, electric-operated pumping equipment and accessories. Fund of \$28,500 has been arranged. McCrary Engineering Co., Atlanta, Ga., is consulting engineer.

Pamlico, S. C., will soon take bids for water pipe line system; also elevated steel storage tank, pumping equipment, etc. Fund of \$28,000 has been secured through Federal aid.

Grand Rapids, Mich., and Kent County FERA Commission, same place, have plans for water pipe lines. Cost about \$50,000 with filtration plant equipment.

McLeansboro, Ill., asks bids until Jan. 21 for water pipe lines and other waterworks equipment. Fund of \$75,000 has been arranged through Federal aid. Warren & Van

Praag, Milliken Building, Decatur, Ill., are consulting engineers.

Toledo, Ohio, will soon take bids for new trunk line to replace present water main in Adams Street, East Toledo. Cost about \$87,000. George Schoonmaker is director of public service.

Lincoln, Ala., will ask bids this month for water pipe lines and other waterworks equipment. Fund of \$80,000 is available.

Sand Springs, Okla., has low bid from National Cast Iron Pipe Co., Kansas City, Mo., for 10,600 ft. of 6-in., at \$7,600.

Steel Labor Board Orders Elections in Carnegie Plants

WASHINGTON, Dec. 31.—Over the vigorous protest of the company, the National Steel Labor Relations Board today ordered that elections be held at the McDonald, Ohio, mill and the Duquesne, Pa., plant of the Carnegie Steel Co. The elections were ordered to determine what organization of workers shall be chosen for the purpose of collective bargaining. The order was asked for by Buckeye Lodge No. 174 of Ohio for the McDonald mill, and Fort Dukane Lodge No. 187 of Pennsylvania. Both lodges are affiliated with the Amalgamated Association of Iron, Steel and Tin Workers.

Both orders require the elections of all productive employees on the payroll prior to the making of the order. The elections are to be held on the seventh and eighth days following the production of the company's payroll. The order requests production of the payroll within seven days from the date of the order. Evidently anticipating court action, the board said that if any application is made to an appropriate court for enforcement of the order, the Carnegie company shall within five days following the court decision produce its last payroll to the board in Washington, the elections to be held on the seventh and eighth days after the decision. The board would supervise the elections.

The company from the outset has challenged the jurisdiction of the board. It contended that the workers are not engaged in interstate commerce. The order itself declares that the company is engaged in such commerce. The company also maintained that the elections were not necessary, inasmuch as elections have been held previously and representatives for collective bargaining had been chosen. These were the employee representative groups which the association calls the company unions.

The board made a distinction between the terms "mill" and "plant," using the former in connection with the McDonald works and the latter in the case of the Duquesne works. Apparently this was done because the company claimed that the McDonald mill is not a complete plant, and that

if an election is held it should include all units making up the McDonald works.

Hearings on both cases were held in Pittsburgh before the board, the Duquesne case on Oct. 2 and the McDonald case on Oct. 3. The employee representation groups at both works joined with the company in opposing elections. The group at the Duquesne plant claimed 87 per cent of the employees desire it to act as their collective bargaining agency with the company. The Fort Dukane Lodge claimed it has 2942 members at the plant and that they represent a majority of the workers. The employee representation group at the McDonald mill claims to represent "a large number of the company's employees."

PITTSBURGH, Dec. 31.—Employee representatives at the McDonald, Ohio, and Duquesne, Pa., plants of the Carnegie Steel Co. have directed their counsel to appeal to the United States district court for a review of the orders of the National Steel Labor Relations Board directing that employee elections be held at their mills. Since the company has not recognized the jurisdiction of the board it is barred from appealing from the board's decision. It is free, however, to bring appropriate action contesting the constitutionality of the board's orders.

November Exports Far Above Those of 1933

IRON and steel exports in November totaled 299,263 tons compared with 157,600 tons in the same month of 1933. Exports for the first 11 months of 1934 were 1,642,457 tons as against 674,758 tons in the corresponding period of 1933. Finished iron and steel exports in November were 60,402 tons as compared with 60,901 tons in November, 1933. For the 11 months they were 755,422 tons as against 418,157 tons in the first 11 months of 1933.

Scrap exports in November were 216,566 tons as compared with 86,577 tons in the same month of 1933. Scrap shipments abroad for the first



IN the home of Arcturus, they take their weather as it comes and not much is done about it. Hence in the cold of winter, very little is accomplished, the inhabitants retreating to underground caverns below the frost line and living upon stores accumulated during the warmer season. It surprises our strange visitor to find that indoors, at least, Earthmen make their weather what they want it to be; warm in winter, cool in summer; even controlling the state of moisture in the air. Arcturus cannot conceal his astonishment as he gazes into factory windows and sees men working in a summer atmosphere while immediately outside the factory walls, other men shiver in Winter's icy blasts.

11 months of 1934 were 1,639,193 tons compared with 672,417 tons in the corresponding period of 1933.

Imports of iron and steel in November totaled 35,272 tons as compared with 28,979 tons in the same month of 1933. Imports in the first 11 months of 1934 were 297,053 tons, which compare with 383,262 tons in the corresponding period of

December Iron Production Rises

PRODUCTION of coke pig iron in December totaled 1,034,983 gross tons, against 956,940 tons in November. The December daily rate, at 33,387 tons, represents a gain of 4.6 per cent over the November average of 31,898 tons a day. With returns in from all active stacks, there was a gain of eight furnaces, 68 being in blast on Jan. 1, against 60 on Dec. 1.

Production for the past year amounted to 15,918,549 gross tons, compared with 13,212,785 tons for 1933.

(The usual tabulations and revised production figures will appear next week.)

Triple Strike in Automobile, Steel and Textile Industries Now Being Considered

WASHINGTON, Jan. 1.—Whether or not it is merely a pose staged to enforce its demands, organized labor has created a stir with its widely publicized talk of a "huge" triple strike in the steel, automobile and textile industries. In the recent past it has made implied threats of a joint demonstration of the kind, making the contention that the three industries have an "unofficial understanding" to stand together against the labor policy of the American Federation of Labor. Repeatedly making this claim, organized labor has built it up to the proportions of a major campaign that evidently has gained force because there has come from none of the three industries a denial of the charge. It has been contended that the allegation is so baseless that it does not merit a denial. However, the fact remains that organized labor has capitalized on the silence of the industries and is gratified that so far the industries have not seen fit to heed the charge.

Giving a more directly pointed tone to its "drive," William Green, president of the American Federation of Labor, last week "privately" called a meeting of the executive council of the federation. Despite the "privacy" of the call, there was a "leak," purposely arranged, some suspect, and the call was broadcast in the daily press. The call is said to have been urged by Francis J. Gorman, first vice-president of the United Textile Workers, who, according to an Associated Press dispatch from Charlotte, N. C., last Saturday was quoted as saying that "a proposal for joint action by textile, steel and automobile manufacturing workers to compel corporations in these industries to recognize collective bargaining would be discussed by the executive council of the American Federation of Labor in January at Washington." It is understood the meeting will be held Jan. 29.

Quoting Mr. Gorman further, the dispatch said, "We will have the biggest strike we ever had unless these discriminations against labor are eliminated."

Organized labor is seeking to enforce recognition and the exclusive

majority rule in collective bargaining, and is bitterly fighting the position of the three industries which insist upon minority representation. Mr. Gorman and other organized labor leaders insist that these industries are united to "prevent realization by labor of its right to organize and bargain collectively."

While the chief fire is directed against the steel, automobile and textile industries, a heavy barrage also has been laid down against the oil and tobacco industries. The attack on the tobacco industry is said to be designed as a further move on the part of organized labor to oust S. Clay Williams as head of the National Industrial Recovery Board. Mr. Williams formerly was president of the Reynolds Tobacco Co., and his attitude on labor has aroused the hostility of the American Federation of Labor.

The Washington meeting of the Executive Council is entirely out of step with the request of President Roosevelt for a capital-labor truce. But it has been observed that it is well timed. Some of the leaders, while evidently desiring to emphasize the fact that prospects of a triple strike will be discussed, affect to give the impression that the meeting will deal chiefly with a legislative program, such as the 30-hr. week bill, collective bargaining, etc. Others are more outspoken and "privately" predict the triple strike will follow the meeting, just when not being indicated.

The timeliness of the meeting, assuming the strategy of organized labor is sound, is seen in the fact that Congress will hardly have gotten under way when it will be impressed by a demonstration of organized labor and therefore be more pliant to its demands than it would be otherwise. Again, the automobile code is to be renewed Feb. 1, three days after the meeting, which seems to be set conveniently close to the renewal date for effect upon enforcement of its demands in the automobile industry, which are numerous and far reaching. As in the case of other industries, it is urging a 30-hr. week, though clearly not expecting its adoption, but

rather a compromise so as to lower the prevailing 40-hr. week. It wants the Automobile Labor Board abolished and with it the proportional plan of representation. It wants a guaranteed wage, with an annual minimum of \$1,500. It wants automobile employment regularized. Study of the latter problem was begun when the automobile code was renewed by the President last November and a report on the study is to be made when the code is scheduled to be renewed again.

Attention is called to the current upward surge in automobile production and to the fact that output of steel has gone to a point where a threat of a strike obviously would carry more weight than it would when output is at a lower point, such as when the Amalgamated Association of Iron, Steel and Tin Workers made an abortive move toward a strike last spring. Organized labor is claiming that a substantial part of automobile production, which accounts for a large part of the steel output, is due to apprehension over labor trouble. Some of the more radical leaders have accordingly insisted that now is the time to throw down tools, but they lack support from many of their own associates, as well as from the majority of non-union workers.

Must Pay Employees For Work Interruptions

WASHINGTON, Dec. 31.—Employees in coded industrial establishments must be paid for interruptions of work beyond their control when an employer requires them to be present and ready for work, under provisions of an administrative order announced by the National Industrial Recovery Board.

The order lists breakdowns, delays, time spent waiting for materials or waiting for the loading or unloading of railroad cars or other vehicles of transportation, and interruptions in activity due to other causes as reasons for interruptions to work over which presumably employees have no control.

Borden Co., Warren, Ohio, has changed corporate name to Beaver Pipe Tools, Inc.

Weirton Brief Denies Jurisdiction Of Government in Labor Case

THE Weirton Steel Co. has filed a 359-page brief as one of the final steps in the most celebrated court case that has arisen out of the welter of disputes surrounding the interpretation of the famous Section 7-a of the National Industrial Recovery Act. The document is based upon testimony of more than 280 witnesses given in the seven-week trial which ended at Wilmington, Del., last month in the United States District Court. The chief counsel for the defendant is Earl F. Reed, who also has represented the Jones & Laughlin Steel Corp., Wheeling Steel Corp. and others in cases involving Section 7-a.

The company's brief indicates that the Weirton company bases its case on the following three major points:

1. That the company does not dominate the employee plan of representation in effect in its three plants. The company contends that the evidence taken in the trial proves that the plan is completely the instrument of the employees, that it complies fully with both the letter and spirit of Section 7-a, and that there has been no violation of the recovery act.

2. That over a long period, employee plans of representation throughout the United States have proved to be effective media for collective bargaining, and are in compliance with the National Industrial Recovery Act.

3. That the relationships between an employer and his employees in the process of manufacture do not come under the interstate commerce provision of the Constitution of the United States, and that therefore the Federal Government has no jurisdiction over these relationships.

Although the two latter points are cited, the Weirton company indicates in its brief that it believes in the principle of collective bargaining and readily accords to its employees the right to organize and bargain collectively. A major part of the brief is devoted to an exposition of the testimony in the trial which showed that the employee plan of representation in effect in the Weirton mills is the free choice of a large majority of the employees, that its organization and method of operation is completely in their hands, and that it has served as the medium through which they have obtained many substantial benefits.

At the time the representation plan was initiated in June, 1933, it is pointed out, the large majority of the employees participating in the election held under it contained not a single voice in opposition to the installing of the plan.

In the summary to its brief, the Weirton company states:

"We submit that there has been no showing on the part of the plaintiff which would warrant the court in issuing an injunction; that to forbid the continuance of the employee representation plan among the employees of the Weirton Steel Co. . . . would be a direct violation of law and the grossest injustice to the large majority of the employees of the company who are satisfied with the plan and prefer to be represented by persons chosen under it. Such an injustice would strike a blow at a great number of employees in the United States who are satisfied and contented to choose their representatives for collective bargaining under plans of employee representation. It would disturb the peaceful and harmonious relations existing between hundreds of employers and over 1,000,000 employees. It would be equivalent to serving notice upon the workers of the country that they must affiliate with national labor organizations to exercise the rights granted them by Section 7-a of the National Recovery Act and place in the hands of selfish labor leaders the most gigantic monopoly imaginable, and this without imposing upon those leaders or the unions any measures of responsibility whatsoever, either to the law or to the workers, the public or the employers."

November Coke Output Higher

A FURTHER gain marked November coke production, according to the Bureau of Mines. Output of both beehive and by-product coke amounted to 2,361,562 tons, or 79,201 tons per working day. This represented an increase of 2.1 per cent, in comparison with the October rate of 77,548 tons, and is the highest rate recorded since June of this year.

Output of by-product coke for the month was 2,267,462 tons, or 75,582 tons daily. Compared with October the rate increased 1.1 per cent. All of the increase occurred at merchant

plants, where the daily average of 33,269 tons was 3.3 per cent greater than that of the preceding month. In spite of a 4 per cent increase in the average daily production of pig iron during November, operations at coke furnace plants declined 0.5 per cent.

Beehive coke production continued to increase, the October rate of 3619 tons per day having been the highest since May, when 5544 tons per day was reported.

For six consecutive months, stocks at by-product plants have risen, the total on hand at the close of November, 3,417,903 tons, having been 10.9 per cent in excess of October's reserves and the highest since December, 1932. The bulk of the October gain was at merchant plants.

Additional Machine Tool Awards Made

WASHINGTON, Dec. 31.—Awards totaling approximately \$1,600,000 have been made by the Army Ordnance Department out of an allotment of \$2,300,000 made to it by the PWA for the purchase and installation of machine tools at arsenals and field service stations. The arsenals will re-advertise for the remaining equipment to be purchased, valued at about \$400,000, the balance left out of the total allotment representing the cost of installation. Since publication of two previous lists in THE IRON AGE awards have aggregated about \$1,000,000 and have been widely distributed to makers all over the country.

The more important awards will be listed in THE IRON AGE next week.

Poole Foundry & Machine Co., Baltimore, has appointed Nibling Engineering Sales Co., 309 Colonial Building, Philadelphia, as its representative for sale of Poole flexible couplings and speed reducers in the Philadelphia district.

Railroad Equipment

Elgin, Joliet & Eastern is inquiring for one Diesel-electric locomotive; inquiry for four additional locomotives is expected.

Chesapeake & Ohio has ordered 10 self-clearing steel hopper cars from American Car & Foundry Co.

Rails

Norfolk & Western is inquiring for 32,000 tons of 131-lb. rails.

Recovery Board to Start Hearings on Price Provisions of Codes Jan. 9

WASHINGTON, Jan. 1.—Hearings to begin before the National Industrial Recovery Board Jan. 9 on price provisions of codes have aroused such widespread interest throughout the country that the board has sent a letter to all code authorities explaining the scope of the proceedings. While this particular hearing, expected to last about one week, is confined to price control or price stabilization, that subject is far reaching in scope.

The evidence to be accepted, without limitation, will include such subjects as basing points, operation of fixed minimum prices, provisions against selling below cost, mark-ups, loss limitations, open price filing with or without waiting periods, discounts, price reportings, resale price maintenance, cost accounting, formulae and systems, free deals, consignment selling and seconds. It was also an-

nounced that production control, capacity limitations and machine hour limitations may be considered but only in so far as these relate to price control or price stabilization.

"The board will hear evidence concerning the operation of price provisions both in general and under approved codes," it was announced. "The hearing is not, however, concerned with proposals to amend any particular code."

The board has requested that oral presentations be limited to 10 min. In no event, it stated, will such presentations exceed 15 min. Briefs may be filed as a substitute for oral statements, or in addition to oral statements.

Those who wish to present their views orally have been asked to file their requests to be heard, their affiliation and their subject or topic with the NIRB by noon Jan. 8.

The price control hearings have excited more interest than the other hearings which are to follow, because of apprehension that price provisions generally are headed for the discard. There will be distinct exceptions. The board has announced that it recognizes the value of permissive cost systems, emergency price provisions and the dangers to the economic structure of destructive price cutting. It also recognizes that minimum prices "may be proper for the normal operations of certain types of industry, but, in such cases, Government supervision and control would naturally tend to be increased."

November Steel Payrolls Rise

NOVEMBER employment and payrolls in the steel industry showed increases over the preceding month, according to the American Iron and Steel Institute. The industry employed 381,663 persons in November, compared with 381,431 in October. In November, 1933, 399,569 were employed.

November payrolls totaled \$32,937,099, as against \$32,723,909 in October and \$32,671,986 in November a year ago. The average number of hours worked per week by employees and average earnings per hour in November were correspondingly greater than in the month before, according to the institute's report.

Employees averaged 27.6 hr. per week during November, contrasted with October's average week of 26.8 hr. Average earnings rose from 72.3c. an hr. in October to 72.9c. in November. One year ago employees working an average of 29 hr. per week earned an average of 65.9c. an hr.

Non-Ferrous Averages

THE average prices of the major non-ferrous metals for December based on daily quotations in the THE IRON AGE, are as follows:

	Average a lb.
Electrolytic copper, N. Y.†	8.75c.
Lake copper, Eastern delivery*	9.12½c.
Straits tin, Spot, N. Y.	50.92c.
Zinc, East St. Louis	3.71c.
Zinc, New York	4.06c.
Lead, St. Louis	3.45c.
Lead, New York	3.60c.

*Blue Eagle copper. †Price ¼c. higher in Connecticut Valley.

The Week's Prices. Cents Per Pound for Early Delivery

	Dec. 26	Dec. 27	Dec. 28	Dec. 29	Dec. 31
Electrolytic copper, N. Y.*	8.75	8.75	8.75	8.75	8.75
Lake copper, N. Y.	9.12½	9.12½	9.12½	9.12½	9.12½
Straits tin, Spot, New York	50.80	50.85	50.75		50.75
Zinc, East St. Louis	3.72½	3.72½	3.72½	3.72½	3.72½
Zinc, New York	4.07½	4.07½	4.07½	4.07½	4.07½
Lead, St. Louis	3.55	3.55	3.55	3.55	3.55
Lead, New York	3.70	3.70	3.70	3.70	3.70

*Refinery quotations; price ¼c. higher delivered in Connecticut.

Aluminum, virgin 99 per cent plus, 19c. to 22c. a lb., delivered.

Aluminum, remelt No. 12 (alloy), carload lots delivered, 14c. a lb., average for week.

Nickel electrolytic cathode, 35c. a lb., delivered; shot and ingot, 36c. a lb., delivered.

Antimony, 13.87½c. a lb., New York.

Brass ingot, 85-5-5-5, 8.25c. a lb., New York and Philadelphia.

From New York Warehouse

Delivered Prices, Base per Lb.	
Tin, Straits pig	52.50c. to 53.50c.
Tin, bar	54.50c. to 55.50c.
Copper, Lake	10.25c. to 11.00c.
Copper, electrolytic	10.00c. to 10.50c.
Copper, castings	9.75c. to 10.75c.
*Copper sheets, hot-rolled	16.00c.
*High brass sheets	14.25c.
*Seamless brass tubes	16.00c.
*Seamless copper tubes	16.25c.
*Brass rods	12.75c.
Zinc, slabs	5.75c. to 6.75c.
Zinc, sheets (No. 9), casks, 1200 lb. and over	10.25c.
Lead, American pig	4.50c. to 5.50c.
Lead, bar	5.50c. to 6.50c.
Lead, sheets	7.25c.
Antimony, Asiatic	15.50c. to 16.50c.
Alum., virgin, 99 per cent, plus	23.30c.
Alum., No. 1 for remelt-	
ing, 98 to 99 per cent	18.00c. to 19.00c.
Solder, ½ and ½	31.00c. to 32.00c.
Babbitt metal, commercial grades	25.00c. to 60.00c.

*These prices are also for delivery from Chicago and Cleveland warehouses.

From Cleveland Warehouse

Delivered Prices per Lb.	
Tin, Straits pig	53.75c.
Tin, bar	55.37c.

Copper, Lake	10.00c.
Copper, electrolytic	10.00c.
Copper, castings	9.75c.
Zinc, slab	5.50c. to 5.75c.
Lead, American pig	4.70c. to 4.95c.
Lead, bar	7.75c.
Antimony, Asiatic	15.75c.
Babbitt metal, medium grade	18.50c.
Babbitt metal, high grade	58.75c.
Solder, ½ and ½	32.50c.

Old Metals, Per Lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators, and selling prices are those charged to consumers after the metal has been prepared for their uses. (All prices are nominal.)

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	5.50c.	6.25c.
Copper, hvy. and wire	5.37½c.	5.87½c.
Copper, light and bottoms	4.37½c.	4.87½c.
Brass, heavy	2.87½c.	3.50c.
Brass, light	2.12½c.	2.87½c.
Hvy. machine composition	4.37½c.	4.87½c.
No. 1 yel. brass turnings	3.75c.	4.25c.
No. 1 red brass or compos. turnings	4.00c.	4.50c.
Lead, heavy	2.62½c.	3.00c.
Zinc	1.87½c.	2.25c.
Cast aluminum	9.62½c.	10.75c.
Sheet aluminum	11.00c.	12.50c.

New Equipment Facilitates Gear Manufacture

(CONCLUDED FROM PAGE 171)

MACHINES for finishing gear teeth—grinding, lapping and chamfering—and for testing and checking gears both during and after manufacture predominated in last year's announcement of new gear making equipment.

Gear grinders included a highly developed unit, designed to correct distortion resulting from heat treatment of spiral bevel and hypoid gears. Use of flaring cup wheel, carried from end to end by an oscillating motion to grind the teeth for their full length, is said to permit grinding of the gears more rapidly than it is possible to finish cut them. Both sides of a tooth space are ground simultaneously.

A machine for grinding the teeth of spur gears measuring from 24 to 72 in. in outside diameter, and 12 in. in face width was also brought out. The teeth may be from 4 to $\frac{3}{4}$ DP, and of any pressure angle. Wheel carriage and indexing mechanism are actuated hydraulically and wheelhead and workhead are counterbalanced hydraulically. The machine uses a grinding wheel that is dressed to the shape and size of the space between two teeth of the gear to be ground. The wheel reciprocates across the gear, which remains stationary.

Inclined Axis Lapping Machine

New gear lapping equipment included an automatic utilizing the "inclined axis" principle, the axis of the lapping members being inclined to the work in such a manner that the normal line of rolling contact is transferred from one parallel axis of the work to one which diagonally intersects the conventional pitch line. Frictional abrasive action is produced along the normal pitch line of the gear tooth by rotary motion only. The method is claimed to result in complete lapping action throughout the entire gear tooth height and width. Reduction in lapping time is attributed also to large area of tooth contact. The machines are adaptable for finishing spur, helical or herringbone gears, and simultaneous lapping of more than one gear, such as cluster gears, may be accomplished.

Gear teeth are chamfered at speeds up to 150 teeth a minute by a new

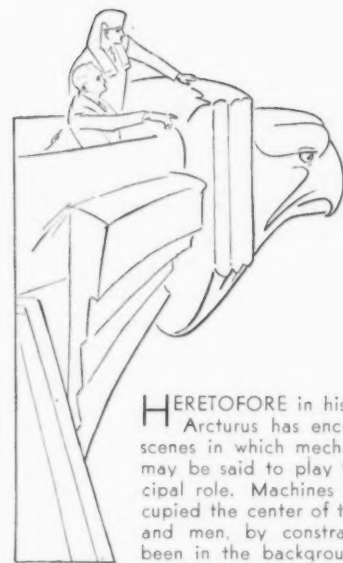
machine that is built in both single and double-spindle models. All types of gears and pinions, including spur, helical, internal, intermittent and spiral bevel are chamfered. The machine will also chamfer splines, cut back intermittent teeth and perform drilling. Set up may be quickly changed for small lot work.

Seven or more new machines for testing and checking the accuracy of finished gears or gears in process were made available in 1934. One of these checks tooth contour, arc of action, length of line of action, tooth to tooth spacing, cumulative error and eccentricity of both spur and helical gears. Either side of the involute curve may be checked without changing arbors, levers, or turning the gears over, the contact point simply being shifted to the other side of the tooth. Direct reading dials indicate plus or minus variations in 0.0001 in.

The same company announced a machine for accurately measuring the helix angles or the lead of helical gears. It is claimed that the only positive method of measuring helical gears is one in which the point of contact with the gear tooth is moved relative thereto across the gear face at a uniform distance from the gear axis while imparting to the gear an angular or rotative movement equal to exactly one revolution during the time that the contact point moves through the exact distance of the lead. The lead of the gear is a constant quantity no matter where the measurements may be taken on the tooth, hence when the lead is found to be correct, the helix angles must be correct. This method is employed for checking the helix angles or the lead of helical gears in this machine. The machine has provision for accurately calibrating its own settings.

Involute Checking Device

Rapid operation is a feature of a new universal involute checking device. The machine employs a sine bar which acts as a compensator for the difference between the length of a 1-deg. arc on the friction disk that originates all of the machine movements and the length of a 1-deg. arc on the base circle of the gear. By using two indicators and a reversible



HERETOFORE in his travels, Arcturus has encountered scenes in which mechanization may be said to play the principal role. Machines have occupied the center of the stage and men, by contrast, have been in the background. But the Earth guide does not want Arcturus to take home with him the thought that mechanization is all important in the scheme of Earth industry. So he makes it a point to tell him of the great part played by Service, in which the will and skill to serve accomplish what mechanization can never hope to. As an example, the Earth guide shows Arcturus an everyday scene in a steel warehouse, where customer service is rendered by skilled and capable manpower.

indicator finger, both sides of a gear tooth can be checked without dismounting or turning the gear upside down.

A gear chart which shows combined errors of tooth profile, tooth spacing, interference and eccentricity, was one of four gear checking machines brought out by one company last year. Each error can be separated from the others and analyzed, this being possible because the gears can be rolled by hand and any tooth profile errors, interference or jump per tooth observed on an indicator. Rotational backlash can also be measured with an indicator.

A machine designed to measure normal pitch in the rotational plane of gears and to check spacing in various types of gears in planes other than rotational was also brought out by the company. It may be used on its own bed or clamped to any machine that has a pair of centers. It may also be attached to worm and bevel-gear cutting machines and the gears checked on their own work arbors. Operation is semi-automatic. Machines for checking helical lead, and for checking involute profile were also offered by the company.

Steel Finishing Capacity Increased by 1,000,000 Tons in 1934—Additional 2,000,000 Tons Under Way and More Contemplated

A PROVISION of the iron and steel code is responsible for the fact that no new blast furnaces, open-hearth units or Bessemer converters were built in 1934. But the code does not forbid the addition of electric furnace capacity and about 30 melting units of this type were installed. More are under way and will be placed in operation during 1935, but the total addition to steel making potentialities will not be large. No crucible furnaces were built during the year, and, according to reports from the industry to THE IRON AGE, none is contemplated at this time.

The steel industry, however, did its bit to promote the revival of the capital goods industries by undertaking considerable expansion in rolling facilities, particularly for flat steel products. Nearly 1,000,000 tons of additional sheet and strip steel capacity was completed during 1934 and the industry's potentialities for rolling flat steel will be increased by another 2,000,000 tons when mills now being built are finished. Two large companies are also considering the installation of continuous wide strip mills with a combined capacity of more than 1,000,000 tons annually, and it is likely that at least one of these will be ordered early in the new year. Details of the year's major installations are showing in the accompanying tables.

Emphasis on finishing mill construction last year was to be expected in view of the demand for greater diversification of finished products. While the automobile industry will likely absorb much of the steel turned out by these mills, a large tonnage of cold-rolled strip produced on re-

versing mills of the Steckel or similar type will be sheared and tinned to meet the growing demand for cold-reduced tin plate.

Much Obsolete Capacity Replaced

The apparent enlargement of steel finishing capacity, however, is not as alarming as it may seem to those who believed that the code should have

limited all new construction in an already overcapacitated industry. Continuous sheet and strip making facilities are rapidly rendering obsolete a large portion of the old manually fed sheet mills. Many of these units have been modernized by the installation of mechanical feeder and catcher equipment, but the low cost of continuous production, if sufficient ton-

TABLE 1: ROLLING MILLS COMPLETED IN 1934

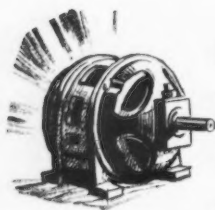
Company	Plant	Type of Mill	Annual Capacity (Tons)
American Sheet & Tin Plate Co.	Gary, Ind.	Two four-high reversing cold strip	100,000
Crucible Steel Co. of America	Harrison, N. J.	8½-in. Steckel cold strip.....	6,000
Eastern Rolling Mill Co.	Baltimore	84-in. four-high reversing cold strip	40,000
Elliott Brothers Steel Co.	New Castle, Pa.	18-in. Steckel cold strip.....	12,000
Globe Steel Tubes Co.	Milwaukee	21-stand seamless tube.....	30,000
Greer Steel Co.	Dover, Ohio	30-in. four-high cold strip.....	20,000
McClouth Steel Corp.	Detroit	20-in. Steckel hot strip.....	50,000
Otis Steel Co.	Cleveland	Two 4-high cold strip.....	75,000
Pittsburgh Steel Co.	Allenport, Pa.	Diescher seamless tube.....	30,000
Reeves Mfg. Co.	Dover, Ohio	28-in. two-high sheet.....	10,000
Washburn Wire Co.	Phillipsdale, R. I.	34-in. two-high reversing blooming	25,000
Washburn Wire Co.	Phillipsdale, R. I.	10 and 12-in. combination strip and rod.....	20,000
Weirton Steel Co.	Weirton, W. Va.	38-in. four-high, four stand cold strip	120,000
West Leechburg Steel Co.	Leechburg, Pa.	20-in. Steckel cold strip.....	12,000
Wheeling Steel Corp.	Yorkville, Ohio	38-in. five-stand continuous cold strip	120,000
Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	42-in. 4-high reversing cold strip.	40,000
Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	44-in. Steckel hot strip.....	250,000
Total			960,000

MILLS UNDER CONSTRUCTION FOR COMPLETION IN 1935

Carnegie Steel Co.	McDonald, Ohio	42-in. four-high continuous hot strip	400,000
		44-in. reversing blooming mill...	.....
		54-in. four-high, five-stand continuous hot strip.....	500,000
Ford Motor Co.	Detroit	Three-stand, tandem cold and 84-in. reversing cold strip.....	250,000
Youngstown Sheet & Tube Co.	Campbell, Ohio	84-in., one four-high, three-stand, and two four-high single-stand cold strip.....	250,000
Youngstown Sheet & Tube Co.	Campbell, Ohio	79-in. four-high, 10-stand continuous hot strip.....	600,000
Total			2,000,000

CAN YOU MAKE SAVINGS LIKE THESE in Your Plant?

■ In plants representing practically every industry, Westinghouse engineers have assisted in making studies of equipment and operating costs that have led to substantial savings. ■ In plant after plant, factory costs have been materially reduced by: Installing up-to-date, efficient machinery that eliminates the waste and extravagance of obsolete equipment . . . and by rearranging plant layout to handle present production more economically. ■ The following are a few typical examples:



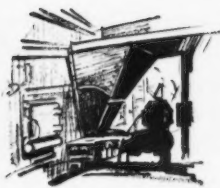
**Individual Motor Drive
Saves \$2280 Yearly**—In a large Eastern shop, 11 machine tools were driven through a line shaft by a 30-hp.

motor. The power bill was \$2884 a year. Individual motors were applied to the machines at a cost of \$1250. This change reduced the power bill to \$604 . . . saving \$2280!

Improved Light Increases Production 25.8%

—A plant manufacturing piston rings and running at about 70% capacity was lighted with an intensity of 1.2 foot candles. In one department the lighting was increased to 14 foot candles. As a result, production for this department increased 25.8%.





Stoker Installation Pays for Itself in 7 Months

—In a large Eastern plant, Westinghouse stokers were installed under five 500-hp. boilers which previously had been hand-fired. At the end of seven months the entire amount of the investment, including that for building changes, was recovered in savings.

Automatic Welding Saves 56% in Repairs

—In a Western railroad shop, Westinghouse automatic arc welding equipment was installed. Among the economies effected were savings of 56% in the cost of building up locomotive wheel centers, and 47% in building up cross-head guides.

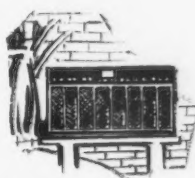


Diesel-Electric Switches Save 53%

—In the yards of a large steel company, plant switching service was provided by steam locomotives costing \$5.95 per working hour to operate. They were replaced by Westinghouse Diesel-Electric locomotives which operated at a cost of \$2.79 per hour, saving 53%. At existing operating schedules it was conservatively estimated that these locomotives would pay for themselves in four years.

Nofuze Circuit Protection Ends Fuse Waste

—In an Eastern repair shop, records kept for two weeks showed that 220 fuses were blown. The cost of new fuses was sufficient to pay for 14 Westinghouse Nofuze circuit breakers which not only eliminate fuse replacement costs but also the waste of man and machine-hours lost when fuses blow.

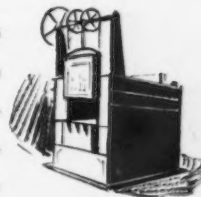


Capacitor Investment Pays 58%

—Special working conditions in a New England plant required that certain machines be over-motored. This caused low electric power factor and a resultant high-rate penalty. Capacitors, for improving power factor, were installed at a cost of \$660, and an annual saving of \$380 in the power bill was effected.

Electric Furnace Saves \$59,220 Yearly

—A large Eastern manufacturer was using a car-type furnace for normalizing steel castings. Pyrometer charts showed little variation in temperature. Naturally, the company believed its product was uniformly heat-treated. However, an analysis led to the installation of a Westinghouse electric furnace, effecting savings in machining costs of 1.28 cents per pound—a saving of \$59,220 yearly.



ELECTRICAL STUDIES OFTEN UNEARTH SAVINGS

■ The examples given above are typical of many cases we have on record proving that electrical equipment can often play an important part in making sizeable reductions in operating costs.

What about costs in your plant? A thorough study may show where certain improvements can be made that will pay for their cost in a surprisingly short time *at existing production schedules.*

Westinghouse Engineers are available to aid you in making such a study. Their wide experience in operation and maintenance problems plus their expert knowledge of electrical equipment often enables them to unearth opportunities for savings that might easily be overlooked.

To obtain their assistance call the nearest Westinghouse office or address Room 2-N, Westinghouse Electric, East Pittsburgh, Pa.

Westinghouse

T85145



nage is available, has forced nearly all of the major sheet producers to install mills of this type.

It is also worthy of notice that refinements in seamless tube manufacture have been accomplished with the installation of two units of different types.

Open-Hearth Repairs Were Few

Last year was the first since the war that no new open-hearth furnace capacity was added, although in 1932 only 100,000 tons was brought in. Last year, furnaces capable of producing 339,000 tons annually were completed and in 1931 the figure was 4,075,000. With the 845,000 tons of capacity added in 1930, the total brought in since the depression began has been 5,359,000 tons.

The Republic Steel Corp. rebuilt its No. 6 open-hearth furnace at Buffalo according to an improved design.

Potential Blast Furnace Units Decreased

The industry's potential pig iron producing capacity was decreased rather than added to during 1934. Although activity was somewhat greater than in the two preceding years, demand for iron was only sufficient to engage an average of 60 furnaces at one time. More than 200 stacks were in blast only occasionally, or entirely out of operation, and not much reconstruction or repair work was undertaken.

Many long-inactive furnaces may never again be blown in, but their owners consider them potential producing units which might be started if demand for iron improved sufficiently. However, five companies either scrapped or abandoned eight stacks last year, as shown in the accompanying list. Their daily capacity was 2500 tons.

Repairs made on furnaces during 1934 were as follows: The Bethlehem Steel Co. erected a new furnace D to replace the former D furnace at Sparrows Point, Md.; in addition, a turbo blower and complete gas cleaning, disintegrating, and distributing system was installed at this plant; The Great Lakes Steel Corp. relined furnace A at Detroit; the Republic Steel Corp. rebuilt sections of and relined furnace No. 2 at Birmingham; Furnace E of the Colorado Fuel & Iron Co., Pueblo, Colo., was rebuilt with a new shell and dome, uptakes, hearth jacket, mantel, and new furnace columns; the Hamilton Coke & Iron Co., Hamilton, Ohio, relined and placed eight new sheets in the shell of its stack.

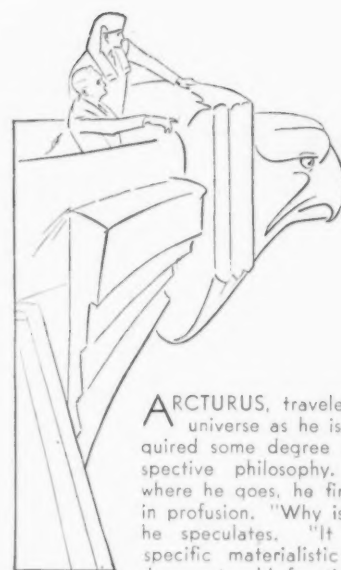
Improvements Reported

Major improvements completed during 1934 or under way at the end of the year in the iron and steel industry were as follows:

United States Steel Corp.

CARNEGIE STEEL CO.
Completed

Schoen Steel Wheel Works: Fabricating equipment for I-Beam-Lok, new type flooring for bridges, etc.



ARCTURUS, traveler of the universe as he is, has acquired some degree of introspective philosophy. Everywhere he goes, he finds color in profusion. "Why is color?" he speculates. "It has no specific materialistic use; it does not add functional efficiency. But what a drab universe this would be without it. Since mankind throughout the universe has been given this power to sense and see color, it must be that the Creator has done this principally to give him enjoyment. And if color, then, is intended as a means of creating pleasure, why not fully recognize this fact and make full use of it?" The Earth guide tells him that we are beginning to realize and act upon this truth; hence the emphasis now placed upon attractive color in product finishing.

Under Way

McDonald Works: 42-in. 4-high strip mill with auxiliary facilities.

ILLINOIS STEEL CO.

Under Way

Gary Works: Converting 28-in. 2-high strip mill into a 36-in. 4-high strip mill, including additions to and improving auxiliary facilities.

Rebuilding two batteries of coke ovens at by-product coke plant.

AMERICAN STEEL & WIRE CO.

Completed

Worcester, South Works: New soaking pit building and eight 6-ingot pits, to be heated by oil.

AMERICAN SHEET & TIN PLATE CO.

Completed

Gary Sheet Mill: Two 4-high reversing cold reduction mills, tempering pass cold mill and auxiliary finishing and shearing facilities.

Under Way

Gary Sheet Mill: Continuous pickling equipment for hot rolled strip, including new building.

Gary Tin Mill: Additional slab heating furnace and improvements to continuous roughing mill.

BETHLEHEM STEEL CO.

Completed

Cambria Plant: Cleaning house and equipment for rod and wire department, electric motor drive for 40-in. blooming mill, improvements to cooling bed of 36-in. universal plate mill.

Lackawanna Plant: Two steam boilers and two annealing furnaces at sheet mills.

Maryland Plant: Patenting furnace and two annealing furnaces at wire mill.

(CONTINUED ON PAGE 284)

TABLE II: NO MORE IRON FROM THESE BLAST FURNACES

Company	Stack	Location	Capacity (Tons per Day)
Belfont Steel & Wire Co.	Belfont	Ironton, Ohio.....	270
Belfont Steel & Wire Co.	Sarah	Ironton, Ohio.....	200
Marting Iron & Steel Co.	Ironton	Ironton, Ohio.....	350
Marting Iron & Steel Co.	Marting	Ironton, Ohio.....	420
Stewart Furnace Co.	Stewart	Sharon, Pa.....	300
Thomas Iron Co.	Mary	Hokendauqua, Pa.....	500
Virginia Iron, Coal & Coke Co.	Max Meadows	Max Meadows, Va.....	165
Virginia Iron, Coal & Coke Co.	Dora	Pulaski, Va.....	300
Total			2,505

TABLE III: ELECTRIC FURNACES PLACED IN OPERATION DURING 1934

Company	Location	Size
Collins Co.	Collinsville, Conn.	One 500-lb.
Kay-Brunner Steel Products, Inc.	Alhambra, Cal.	One 1500-lb. basic
General Metals Corp.	San Francisco	One 1½-ton
International Nickel Co.	Huntington, W. Va.	One 20-ton

ELECTRIC FURNACES UNDER CONSTRUCTION OR CONTEMPLATED

Company	Location	Size
United States Navy Yard	Boston	One 120-lb. induction
United States Navy Yard	Washington	Two 2000-lb. induction
United States Navy Yard	Washington	One 250-lb. induction
United States Navy Yard	Washington	One 50-lb. induction
Collins Co.	Collinsville, Conn.	One 500-lb.
Cleveland Steel Casting Co.	Cleveland, Ohio	One 1½-ton

United States Made Less than Third Of the World Steel Last Year

WORLD production of pig iron in 1934 amounted to 61,350,000 gross tons, an increase of 26.6 per cent over the 48,470,000 tons of 1933. World output of steel (ingots and castings) showed an expansion to 78,750,000 tons in 1934 from 65,740,000 tons in 1933, or 19.8 per cent. Increases in the United States were not in as high a ratio. In pig iron, the betterment was only 18.7 per cent (against 26.6 per cent for the world), or from 13,350,000 tons in 1933 to 15,850,000 tons estimated for 1934; in steel, the 1934 volume was only 11 per cent

INCREASE Over 1933 Was 11 Per Cent, Compared with 19.8 Per Cent for All Countries—United States Pig Iron Output Showed 18.7 Per Cent Gain Over Preceding Year Against World Expansion of 26.6 Per Cent—America Made 32.8 Per Cent of All Steel Instead of Former 45 Per Cent—Russia Accounted for 16.6 Per Cent of All Pig Iron

By W. W. MACON

more than that of 1933, or 23,230,000 tons in 1933 and 25,850,000 tons in 1934.

Statistics for 1934 emphasize the ascendancy of Russia. In 1924 that country accounted for 1 per cent of all the pig iron produced; in 1934 it turned out 16.6 per cent. Again, Russia's share of the world steel rose from 1.27 per cent in 1924 to 11.75 per cent in 1934. Putting it in another way, 10 years ago 81 per cent of all the pig iron and all the steel came from the United Kingdom, Germany, France and the United States. In 1934, these same nations made less

The accompanying diagram (based on the separate ten-year graph of monthly steel outputs) shows the different ways in which the depression affected the industry in the leading producing countries. The heavy dots indicate the average monthly production (ingots and castings) in 1929. In the United States in that year, the range of fluctuations in operations was wide and the peak month was 17 per cent above the year's average. The high month for the United Kingdom was 10½ per cent above the average, that for Germany was 8½ per cent and that for France only 5 per cent.

Output in the United States was virtually a continuously falling one from the peak for a period of 38 months. It was a drop from 5,400,000 gross tons in May, 1929, to a low of 810,000 tons in July, 1932. Then there was a sidewise movement for eight months, or through March, 1933, averaging 967,000 tons. A similar trendless swing of fluctuations, but on a higher level for 15 months, through July, 1934, averaged 2,416,000 tons a month, and at the close of 1934 there was a sidewise movement through November, 1934, of 1,440,000 tons a month.

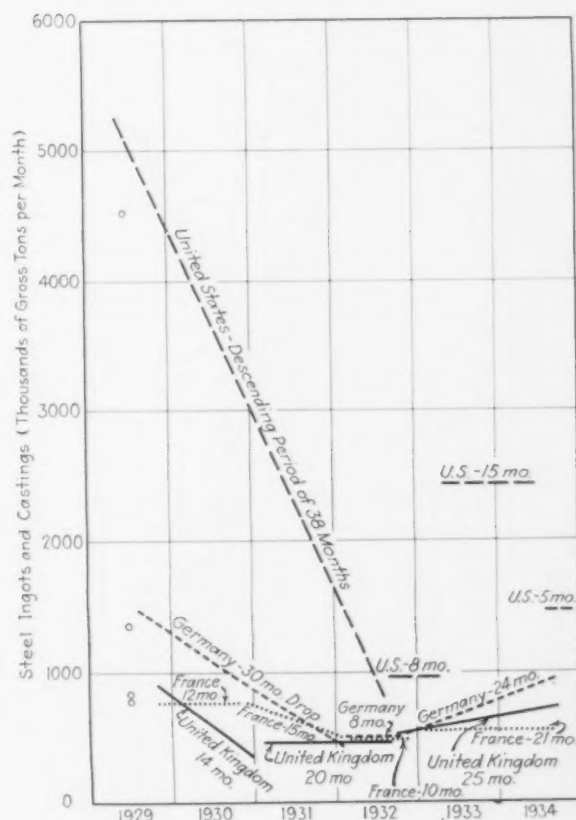
The United Kingdom beginning in 1929 experienced a drop for 14 months from a maximum of 890,000 tons to a minimum in December, 1930, of 337,000 tons. It then remained at a low average of 433,000 tons for 20 months before an upward trend was discernible. This for 25 months has shown a recovery rate of roughly 45 per cent per annum.

In the case of Germany, there was a drop for 30 months from a high of 1,443,000 tons to a low of 397,000 tons (January, 1930, although a further low of 387,000 tons was registered in September, 1932). Then for eight months there was a sidewise movement averaging 464,000 tons a month followed by recovery for two years at the rate of 55 per cent per annum.

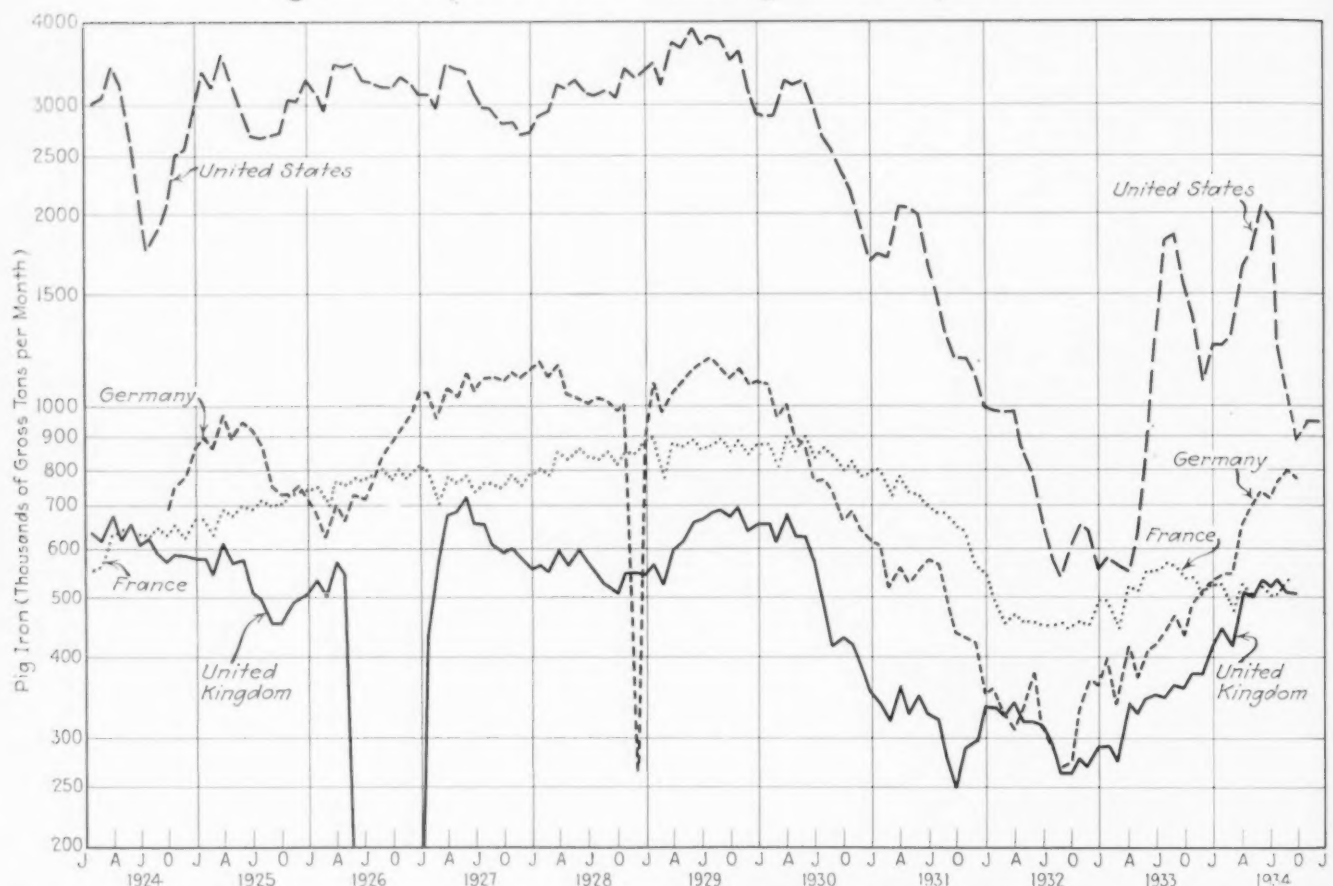
France, at the incidence of the depression, continued more or less sidewise for 12 months, through October, 1930, averaging 783,000 tons a month (with a peak in October, 1929, of 834,000 tons and a 1929 average of 795,000 tons). Then for 15 months there was a slide to 462,000 tons to January, 1932. Production remained for 10 months close to an average of 455,000 tons, on through November, 1932, and then it reached a new level of 522,000 tons a month through August, 1934.

PRODUCTION OF STEEL INGOTS AND CASTINGS

	U. S. A.	Germany	United Kingdom	France
Monthly aver., 1929, tons	4,510,000	1,330,000	805,000	795,000
Monthly aver., 1932, tons	1,091,000	472,000	438,000	460,000
Monthly aver., 1933 and '34, tons	2,045,000	790,000	665,000	520,000
Monthly aver., 1932, Under 1929, per cent	76	64½	46	42
Monthly aver., 1933 and 1934, Under 1929, per cent	55	40	17	35



Pig Iron Output of Four Producing Nations by Months



THE comparative stability of the French industry with its steadily mounting volumes during the early years of the cycle is to be noted, and also the relative freedom of France from the effects of the world-wide depression. This fact is brought out in the subjoined table.

The table serves to give a percentage measure of the extremes in pig iron output compared with the average. The French dip was somewhat further below the average than was its peak above it, but neither high nor low exhibited the swings that occurred in the German or even the British pig iron field. Compared with the French low month, 37 per cent off from the average, the American pig iron producer had to adjust himself to nearly an 80 per cent curtailment, while Germany faced a 64 per cent cut and the United Kingdom one of 46 per cent.

Pig Iron Production (Monthly Averages, Thousands of Gross Tons)

	United Kingdom	United States	Germany	France
1924	609.0	2,617.1	610.8	631.1
1925	521.8	3,058.4	834.9	696.8
1926	204.8	3,281.1	791.1	773.7
1927	607.7	3,047.1	1,074.8	762.4
1928	550.8	3,179.6	968.3	818.7
1929	632.4	3,522.2	1,099.3	856.7
1930	516.0	2,616.6	795.2	828.4
1931	314.4	1,522.9	497.4	674.9
1932	297.8	723.9	322.6	456.1
1933	343.6	1,103.6	432.0	519.0
Ten-year average	459.8	2,467.3	742.6	701.8
Per cent of world output	7.7	41.5	12.5	11.8
High month	688.7 (10/29)	3,898.1 (5/29)	1,185.0 (7/29)	888.9 (1/29)
Low month	248.2 (9/31)	530.6 (8/32)	264.2 (8/32)	438.1 (9/32)
High above aver., per cent	50.0	58.0	60.0	26.5
Low below aver., per cent	46.0	78.5	64.0	37.0
1934, estimated	500.0	1,321.0	729.0	504.0
Per cent of world, 1934	9.8	25.9	14.3	9.8

World Production of Steel Ingots and Castings (Millions of Gross Tons)

	1929	1930	1931	1932	1933	1934*
United Kingdom	9.64	7.33	5.20	5.26	7.02	8.95
Germany	15.99	11.36	8.16	5.68	7.49	11.55
France	9.55	9.33	7.70	5.55	6.43	6.05
Belgium	4.04	3.30	3.06	2.76	2.70	2.90
Luxemburg	2.66	2.24	2.00	1.93	1.82	1.90
Saar	2.17	1.91	1.51	1.44	1.65	1.95
Russia	4.65	5.46	5.00	5.50	6.74	9.25
Poland	1.36	1.22	1.02	0.54	0.80	0.85
Sweden	0.68	0.60	0.53	0.52	0.62	0.80
Czechoslovakia	2.11	1.81	1.50	0.75	0.74	0.95
Italy	2.11	1.75	1.43	1.37	1.76	1.80
United States	56.43	40.70	25.95	13.68	23.23	25.85
Canada	1.39	1.01	0.67	0.34	0.40	0.75
Spain	0.97	0.86	0.59	0.49	0.46	0.55
Other Countries	4.65	4.33	4.09	3.87	3.88	4.65
Totals	118.40	93.21	68.41	49.68	65.74	78.75

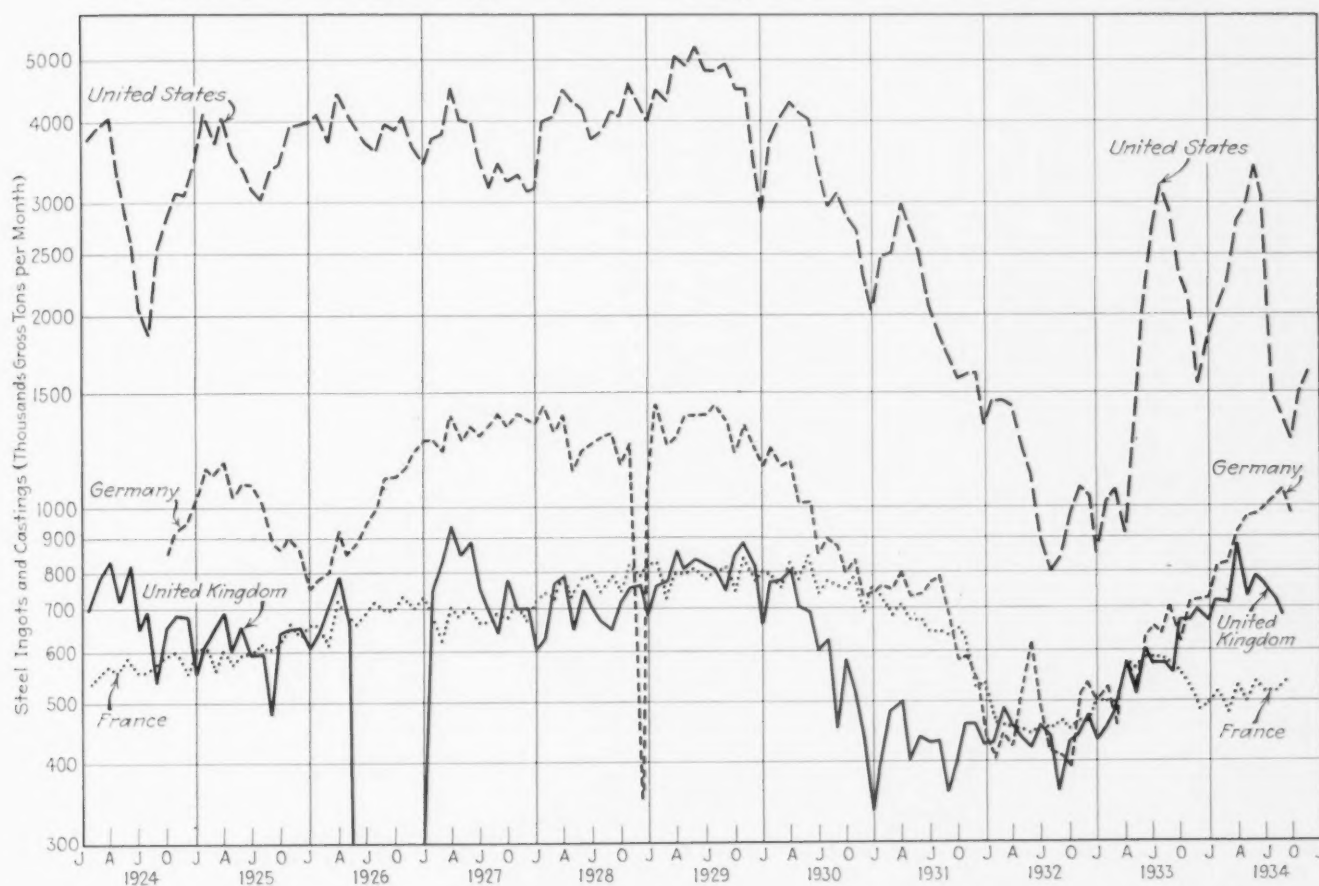
* Estimated.

than 60 per cent of the pig iron and 66½ per cent of the steel.

Besides Russia, Japan has been taking an increasingly large part in the manufacture of pig iron and steel. Japan's contribution to pig iron output in 1924 was 1.22 per cent and in 1934 about 3.5 per cent; in steel it was 1.44 per cent in 1924 and 3.24 per cent in 1934.

Accordingly, whereas 10 years ago four nations supplied in excess of four-fifths of the pig iron and steel,

Production of Steel Ingots and Castings for a Full Ten-Year Cycle



ALTHOUGH at the close of the war there were estimates that Great Britain, France and Germany in respect to steel-making capacity would be on a close parity, the chart shows greater outputs over most of the past ten years for Germany. For the period since 1929 the United Kingdom of the three nations named experienced the severity of the depression first, with a sharper rate of drop in activity than befell the United States although it obtained for a shorter time and proved no close approach to the ultimate curtailment that struck American steel. While the British steel industry remained in the doldrums in 1931 and 1932, those of the other nations still kept falling; however, it has since made the best relative showing, seeing that it is nearest of all to its pre-depression level of activity.

Output of Steel Ingots and Castings (Monthly Averages, Thousands of Gross Tons)

	United Kingdom	United States	Germany	France
1924	685.1	3,161.0	806.8	566.0
1925	615.5	3,782.8	1,000.3	608.3
1926	299.7	4,024.5	1,012.5	691.5
1927	758.1	3,744.0	1,338.1	678.0
1928	710.0	4,295.0	1,190.8	779.3
1929	803.0	4,703.0	1,332.7	792.8
1930	610.5	3,391.0	946.5	771.3
1931	433.5	2,162.0	680.3	640.7
1932	438.5	1,140.0	471.6	459.7
1933	583.6	1,936.0	622.0	535.3
Ten-yr. aver.	593.8	3,233.9	940.2	652.3
Per cent of world output	8.25	45.0	13.0	9.1
1934*	745.0	2,155.0	963.0	504.0
Per cent of world, 1934	11.35	32.8	14.7	7.7

*Estimated.

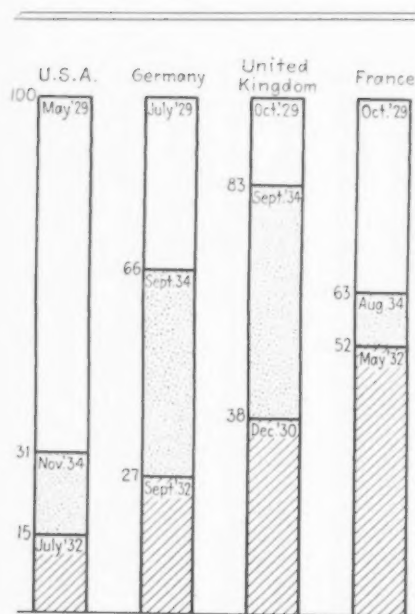
in 1934 it took five countries (Russia as well as the United Kingdom, Germany, France and the United States) to provide for no more than 76.4 per cent of the pig iron or as much as 78.5 per cent of the steel.

America slipped further in 1934 with respect to its long preeminent position at the head of the procession. It made 25.9 per cent of the total world output of pig iron in 1934, compared with 27.6 per cent in 1933 and an average for the 10 years ended with 1933 of 41.5 per cent. It made 32.8 per cent of the steel in 1934,

World Production of Pig Iron (Millions of Gross Tons)

	1929	1930	1931	1932	1933	1934*
United Kingdom	7.59	6.19	3.77	3.57	4.14	6.00
Germany	13.19	9.54	5.97	3.87	5.19	8.75
France	10.20	9.88	8.07	5.45	6.22	6.05
Belgium	3.98	3.31	3.15	2.74	2.70	2.85
Luxemburg	2.86	2.43	2.02	1.93	1.86	1.90
Saar	2.07	1.88	1.49	1.33	1.57	1.75
Russia	3.95	4.90	4.30	5.50	7.06	10.20
Poland	0.69	0.47	0.34	0.20	0.30	0.35
Sweden	0.52	0.49	0.41	0.28	0.35	0.50
Czechoslovakia	1.62	1.42	1.20	0.56	0.49	0.60
Italy	0.66	0.53	0.50	0.45	0.51	0.50
Spain	0.74	0.59	0.47	0.30	0.33	0.45
United States	42.61	31.75	18.43	8.78	13.35	15.85
Canada	1.16	0.81	0.47	0.16	0.26	0.40
Other Countries	5.51	5.01	4.43	3.74	4.44	5.26
Totals	97.35	79.20	55.02	38.86	48.47	61.35

*Estimated.



High, Low and Current Output of Steel Ingots and Castings of a Ten-Year Period

TAKING as 100 the peak month's production (which occurred in 1929 for the four producing nations shown), the low month's output fell to 15 per cent of the maximum in the case of the United States. Germany dropped in its extreme case to 27 per cent, the United Kingdom (which found a minimum in December, 1930) fell to 38 per cent and France's low was 52 per cent.

Recovery as far as it is represented by current output has likewise been low for U. S. A., activity in the late weeks of last year being barely twice that of the low month and still nearly 70 per cent below the top. Germany's year-end production rate was nearly $2\frac{1}{2}$ times the low, with England at nearly a $2\frac{1}{4}$ ratio, but with France, which sustained the lightest impact of the depression, operating less than $1\frac{1}{4}$ times the low.

The chart shows particularly the giant swings experienced by the American industry.

35.3 per cent in 1933 and 45 per cent for the 1924-1933 decade.

Supplementary information is contained in the accompanying tables and graphs. They point out the different ways in which the depression has affected output in the leading producing nations, analyze movements in a way that hitherto has not been done, and in particular illustrate the severity of the depression in the iron and steel industry of the United States. For much of the production data, THE IRON AGE is indebted to the British Iron and Steel Federation.

PWA Has Furnished Three Billion Hours of Employment

WASHINGTON, Jan. 1.—More than 3,000,000,000 hours' employment have been provided by PWA, not including the amount of CWA, CCC and administrative work financed by public works allotments, while 150,000,000 man-hours of employment, extending into every State, were created in 1934 by PWA railroad loans, according to Harold L. Ickes, Public Works Administrator. A year-end review of public works activities reported to Mr. Ickes was said to have revealed that expenditures on all phases of the public works program have exceeded \$2,000,000,000. With the beginning of a new year 9100 projects have been completed, 7600 are under construction and 2800 others have received allotments and will be under way before long.

Virtually all funds at the PWA's disposal, with the exception of what is derived from operation of the revolving fund and changes in allotments, have been allocated. "PWA has cleared its decks for action and can launch in short order whatever new program the President recommends and Congress approves," said Mr. Ickes.

"Of the \$2,000,000,000 which has been spent out of the \$3,700,000,000 appropriation, \$1,250,000,000 has been spent on construction projects alone. This relates to \$3,000,000,000 of PWA financed construction and includes approximately \$294,000,000 raised by borrowers."

Loans out of the total PWA fund to 30 railroad companies amounted to \$193,276,500. Of this amount more than \$100,000,000 went for materials and supplies. The amount actually paid out to railroads was \$145,000,000. Most of the program is finished and the remainder nearing completion.

Modern Railroad Equipment Bought

"Much modern equipment, including streamlined trains and air-conditioned passenger cars, has been purchased," said Mr. Ickes. "Many old and unsafe wooden passenger cars have been replaced with steel safety coaches. New rails have been pur-

chased and laid. Bridges and tunnels have been repaired with more modern and safer structures designed to carry the heavy traffic of today.

Reviewing separately the results of each phase of the PWA railroad improvement and construction program, Administrator Ickes disclosed their significance to employment and the purchase of materials. Loans of \$133,886,250 were made to 23 railroads for improvements and construction work to be done in shops and rights of way, and with which they purchased up to Nov. 15 \$73,295,000 worth of iron, steel, copper, cement, etc.

The remainder of the \$100,000,000 worth of material purchases was made by equipment manufacturers. Loans of \$59,390,250 were made to 18 railroads to purchase new engines, freight and passenger cars and high-speed streamlined trains manufactured in outside shops. These equipment purchase loans resulted in the placing of orders for 14,675 freight cars, 264 passenger train cars, 70 steam engines, 20 Diesel engines, 33 electric locomotives and four high-speed trains. Orders were placed with 26 manufacturers. Latest reports to the PWA show that the new equipment turned out consisted of 14,425 freight cars, 150 passenger cars and 54 locomotives of all types.

Fabricated Bookings Higher in November

BOOKINGS of fabricated structural steel in November amounted to 60,896 tons, according to reports received by the American Institute of Steel Construction from shops representing 82 per cent of the industry. They showed a 32 per cent gain over October, 11 per cent over the average for the third quarter and 13 per cent over the same month last year.

Shipments declined to 56,023 tons, having been 12 per cent less than in October and 3 per cent below the third quarter average but were 55 per cent larger than November, 1933.

Backlogs, amounting to 283,754 tons, were below the backlog this time last year.

ON THE ASSEMBLY LINE

Automobile Makers Push Production to Supply Dealers with New Models



DETROIT, Jan. 1.

WITH a zip and a zest reminiscent of the 'twenties, the automobile industry is speeding toward a high production goal in January. Conservative observers are shaking their heads over the way in which caution apparently has been cast aside. However, it should be remembered that every manufacturer is mindful of the value, from the standpoint of immediate sales, of having cars in the field for immediate delivery to customers. Chrysler set the pace by ordering heavy assemblies in all divisions. General Motors and Ford, aware of Chrysler's activities, don't intend to be caught with dealers' floors bare of cars. Hence the mad manufacturing pace.

Upon actual retail sales in January will depend how long car factories will continue their headlong rush. Detroit's guess is that the first production run, primarily to put new models into dealers' hands, will not be followed by a lull. Instead it is believed that assemblies will mount month by month until the seasonal

peak is attained in the spring or early summer. Only in the two depression years of 1932 and 1933 has February output fallen below that of January. Last year there was a substantial increase, and there is no good reason why February this year should not be better than January.

Only the limitations on deliveries of raw materials and parts stand in the way of a January rivaling that of 1930 when assemblies totaled 283,610 units. It is impossible at this time to tell what the industry's production this month will be. The only safe prediction is that made in this column a week ago to the effect that January's performance will be the best in five years. Unless unexpected barriers hinder operations, February assemblies should top 300,000 units, thus establishing the best record for that month since 1930, when 345,961 units were manufactured.

Next Saturday, with the opening of the New York Show, the 1935 automotive year will formally get under way. Technically, the show may no longer be a national affair,

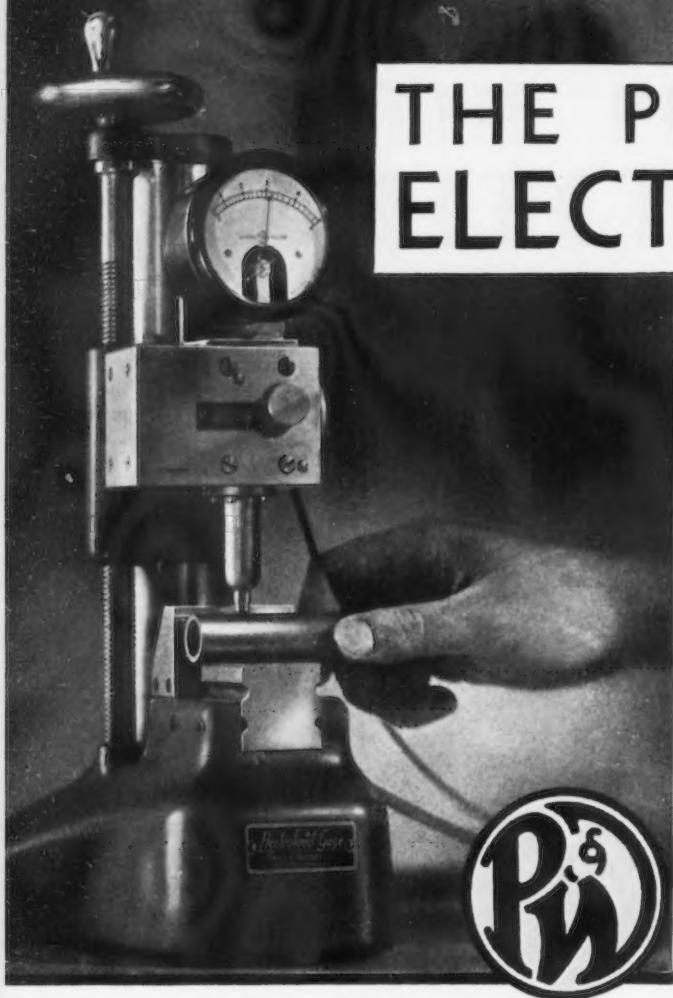
but the industry still regards it as the big event of the year. In fact, interest will be enhanced by exhibits of the Ford Motor Co., which heretofore has not been a participant.

Not until the doors at Grand Central Palace are thrown open on Saturday will the public get its first view of the new Packard 120, the name given to Packard's light straight-eight.

This new car is powered by an 110-hp. engine and is built on an 120-in. wheelbase. Its radiator and hood treatment is similar to that of the larger Packards.

The independent springing system on the Packard 120 has been dubbed "Safe-T-Flex." Torque arms from a pivotal point in the center of a frame cross member extend to the lower ends of carriers for the front wheel king pins. Coil springs between these arms and the frame carry the weight of the car. The arms hold the king pins in permanent alinement and thus the wheels. Large double-acting shock absorbers, with arms running from the frame to the top ends of the king pin carriers, ease

THE PRATT & WHITNEY ELECTROLIMIT GAGE



Above is the P & W Standard 4" Electrolimit External Comparator arranged for inspecting automotive wrist pins to "tenths". The automotive industry is inspecting and grading wrist pins, pistons, connecting rod bearings, cylinder bores and other parts with this new instrument. Almost perfect assembly is the result.



Below is an automotive piston inspection unit using red and green lights to indicate exceeded limits. The four master gages are used for setting the unit.



Industry has adopted the Pratt & Whitney Electrolimit Gage as its newest and most successful inspection tool. This new instrument combines mechanical gaging with electrical magnification to obtain either external or internal measurements. Its mechanical parts are produced by Pratt & Whitney craftsmen. The electrical parts are made by General Electric Company.

The Pratt & Whitney Electrolimit Gage provides dependable inspection for a wide range of work, much of which previously was considered either impractical or impossible. Most important of all, the Electrolimit Gage is the perfect size grading instrument for selective assembly, with its attendant lowering of assembly costs.

Examine the Electrolimit Gage applications on these two pages. Each installation is doing its job of accurate inspection day after day. Each one has its story of easier, quicker results coupled with unfailing precision. Let us tell you these results and many more like them. A letter from you to our nearest branch office or directly to our factory will bring complete information.

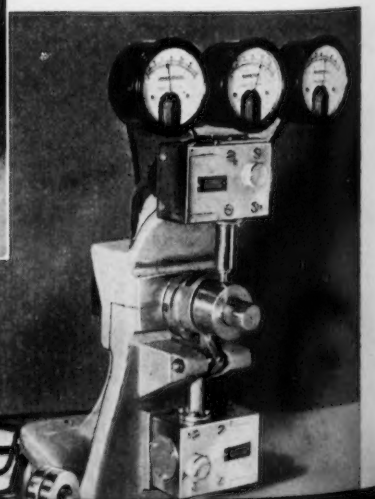
PRATT & WHITNEY COMPANY HARTFORD, CONNECTICUT

Branch Offices and Agencies: Birmingham, Boston, Chicago, Cincinnati, Cleveland, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, Rochester, St. Louis, and San Francisco

At the left is the Electrolimit equipment for exploring cylinder bores in automotive and aeronautical engines. It easily finds local imperfections, out of roundness, taper, size errors, etc. Gages of this portable type are especially suited for inspecting parts which are too large to be handled conveniently.



At the left and below are a two station and a three station gage. Inspecting several dimensions on a piece simultaneously means distinct savings in time and money. It can be done frequently with Electrolimit Gages.



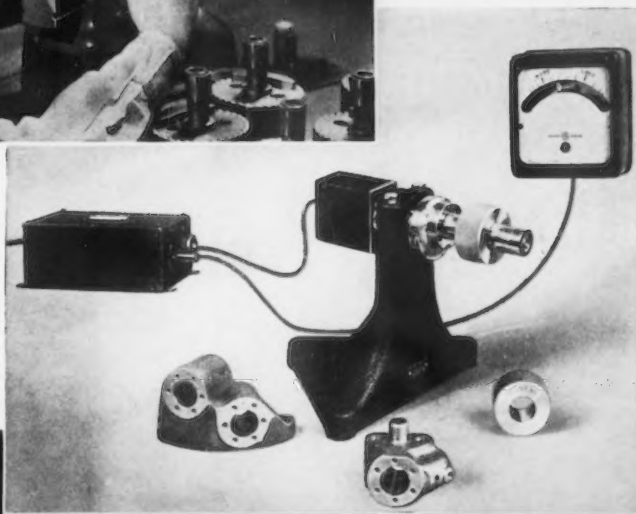


Gaging an extremely accurate electric refrigerator part to "tenths". The piece in the operator's left hand is a counterbalance to facilitate handling.

Right: The speed of gaging and sorting wrist pins to "tenths" with Electrolimit equipment is many times greater. After the equipment is set initially a highly skilled operator is not necessary. Wrist pins, pistons and connecting rods graded in this manner assemble almost perfectly.



Right: The Electrolimit Gage arranged as an Internal Comparator. One of the two master setting gages is on the spindle.

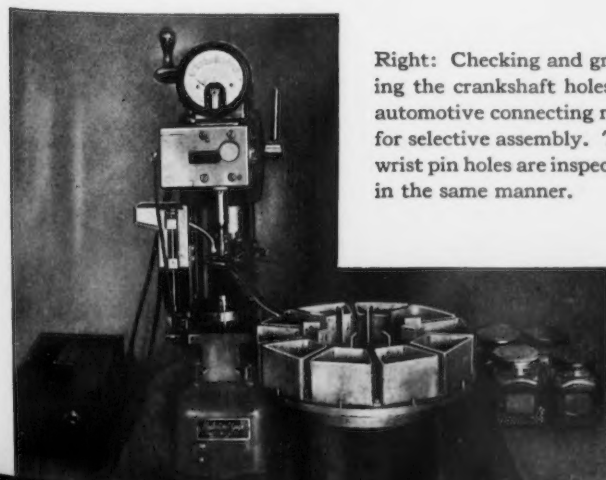


The external angles of this small piece must be accurately 90° . The Electrolimit Gage inspects them quickly and accurately. The two holes have previously been gaged for diameter and squareness by another unit.



This operator is checking the outside and inside diameters, and the squareness between the hole and face of an electric refrigerator part.

Below is a special Electrolimit Gage application for sorting steel balls to "hundred-thousandths". The balls are fed down one at a time from a small hopper. They pass under the gage spindle, and the operator rotates the circle of bins so that each ball drops into the proper compartment. Sorting to this extreme size limit would be a very costly operation without Electrolimit equipment.



Right: Checking and grading the crankshaft holes in automotive connecting rods for selective assembly. The wrist pin holes are inspected in the same manner.



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IT PUTS REAL MEANING INTO THE TITLE "HIGH SPEED."

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It Never Falls Asleep at the Switch—It compels operator "Bill" to keep right up on his toes when running it. But it is so simple and easy to operate, Bill never gets tired when "at the wheel."

In the past year in the face of business apathy this 12-inch Shaper has gone into nationally known factories making typewriters, ball bearings, electrical goods, automobiles, sporting goods, can machinery, tools, and others.

Remember, HENDEY has been building high class Shapers since 1875. That means experience.

Should you want to read up on this Shaper, we are ready to mail an 8-page bulletin in color as soon as we hear from you.

THE HENDEY MACHINE CO.
Torrington, Connecticut

action of the springs. The coil springs, incidentally, are being made for Packard by Chrysler Corp. in its Dodge plant. Hydraulic brakes, aluminum cylinder head and pistons and forced draft crankcase ventilation are other features of the new Packard. About 50 cars have been built by hand for the shows around the country. Production won't begin until February.

On an 113-in. wheelbase, the new Master Chevrolet has a slightly V-shaped radiator sloping at a 31-deg. angle. Doors extend lower below the floor, which has been dropped one in. by lowering the chassis side rails. The V-radiator is narrower and more sloping, the fenders highly contoured in their streamlining. All models have the solid steel top, but bodies still are of wood-and-steel construction. The crankshaft has been redesigned and now weighs 69 lb.; counterweighting has been increased 80 per cent. Fisher no-draft ventilation and knee action are continued. All closed models have pressed steel wheels. Wire wheels are used on other models. The Standard Chevrolet is practically a duplicate of the 1934 Master, even to the Blue Flame engine. It has the conventional front end and top. Both the Master and Standard have electro-plated pistons, a new waved driven clutch plate eliminating chatter, more rigid frame and a new system of lubrication to serve the crank-pin bearings of the connecting rods.

Ford has bought a considerable amount of new machinery in this country for delivery to its Dagenham, England, plant; to its Cologne, Germany, plant and to the Mathis plant in France. In each of these three factories the V-eight engine soon will be manufactured. Previously the V-eight engine was imported by the English plant from Ford of Canada and assembled cars shipped to France and Germany.

Cadillac is believed to be on the verge of a tooling program for production of a V-eight engine for its new car to be introduced in the spring. The V-eight block and crankcase will be cast integrally, it is said. The V-eight motor, of course, will replace the present straight-eight. It is not known how much money will be spent for retooling, but it is possible that much of the present equipment may be rebuilt.

Washington, in Prospect and Retrospect

(CONCLUDED FROM PAGE 64)

merce, which is so persistently reported to exist, would likely result in a Department of Commerce victory, much to the satisfaction of industry. This breaking up of the NIRB, however, may be just another of the many "trial balloons" being sent up from Washington.

Of other matters of importance to business and industry over which the Government has jurisdiction, the following summary is offered, but, like railroad time-tables, it is subject to change without notice because of quickly shifting Federal policies.

Taxation: How they can manage to do it in view of huge relief expenditures and other appropriations that lie ahead is hard to be seen, but leaders in Congress say they hope to continue the present scale of taxes despite the onslaught radicals will make to "soak the rich."

Social legislation: Unemployment reserve legislation is marked for this session of Congress with Presidential backing. Details have not been worked out, but the States will be asked to cooperate, with the Federal Government bearing its part along with employers and employees. It may follow the Deane plan for "job insurance," creating payroll tax on employers to be assessed only when employment rises above a previous average, the tax to go to a Government fund to be used in compensating employees when monthly hour-average is less than long-time average.

Financial policy: Further devaluation of dollar apparently is opposed by the Administration. The danger of uncontrolled inflation appears to have passed, with the prospect of controlled inflation through credit. The new Federal Reserve governor supports idea of centralized management-and-control of credit. One reason money is not being released by banks and industry is believed to be fear of Government controlled credit as well as socialistic tendencies to control power industry, as forerunner of control over other industries. On the other hand, experimentations of all sorts by the Administration seem to be less popular and to be giving way to more practical plans for cooperation with industry. Governor Eccles,

however, thinks a new Government central bank is undesirable.

AAA—Evident feeling in Administration is that "scarcity program" has been a dud, but demand for its continuance is likely to come from farmers who have enjoyed the Government subsidies.

Delousing Securities Act of 1933

(CONTINUED FROM PAGE 100)

act, which cannot be ignored. It was heard most frequently before passage of the amendments. It is that the securities act is a statutory means with the end of destroying private enterprise and replacement of it with financing through government agencies. Private enterprise has been restricted during the greater part of the act's operation and the government has taken up the financing gap in a spending to speed recovery. Such object may have been in the minds of certain proponents of the law, but its achievement appears to be an impossibility under the present control within the Securities and Exchange Commission.

In the course of our consideration of the 1933 act, the place of the Securities and Exchange Commission has been stressed. The assumption by the new agency of administration of the law is extremely important. First of all, the S.E.C. is more forceful in its actions than was the Federal Trade Commission. Its members appear more cognizant of the dangers to recovery of a dormant capital market. They appear more willing to treat with "reputable business" and as a result have developed a feeling of cooperation from business leaders.

There is one amendment to the act which has been neglected but which may play an important part in the workability of the measure. Subsection (a) of Section 19 was amended to permit the commission to define not only accounting and trade terms but also "technical terms." Provision was also made that acts based on any rule or regulation of the commission may not impose a liability, even though such rule of the commission may be amended, rescinded or be determined invalid by judicial or other authority. This means that with aggressive commissioners establishing

OHIO MAGNETS and MAGNET CONTROLLERS

have been markedly improved during these last four years and the improved features have had plenty of time to demonstrate their value in one to three years of hard mill service.

Ohio Magnet improvements include the following:

Copper strip in coil is widened and there is more of it; coil is mounted on a steel ring attached to steel face plate and removably to the top of magnet case. Outer ring is heavier and stronger. Outer ring or center pole can be taken off the magnet without disturbing the coil or its terminal connections. Insulation and waterproofing have both been improved.

Each size Ohio Magnet has maximum continuous lifting capacity and a longer useful life built into it. We recently furnished repair parts for an Ohio Magnet sold in 1918.

Ohio Magnet Controllers now have Lavite, *unburnable*, arc shields; and thyrite arc suppressors, *built in*, to quickly absorb the kick voltage, prevent big arc at control contacts, protect the line and insure quick drop.

Ohio solicits your careful consideration and patronage.

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United States Steel Corporation and its
subsidiaries is the history of the develop-
ment and perfection of American steel*

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Our sheets must carry a better finish. Our rolls must, therefore, carry a better finish. There you have the unanimous decision of the steel industry.

Meeting this demand for better finish is the Landis Type 30 Roll Grinder. Not by accident but by well thought out design it is playing its part in the turning out of better sheets in more than one mill. Multiple V belt work drive, all electric control, a crowning and concaving mechanism that produces symmetrical contours and force feed lubrication to guide-ways and spindles are only some of the features making for such satisfactory results.

If you are striving for better roll finishes but are not getting them turn to the Landis Type 30. If your present Roll Grinder capacity is over-taxed turn to the Type 30 Landis. If you think we are too enthusiastic about this machine, at least ask us for a copy of catalog H-301. We suspect it will interest you more than just a little. 177

LANDIS TOOL CO.
WAYNESBORO, PA.

precedents and ruling quickly on ambiguous requirements, issuers may rely upon the rulings without fear of future repercussions.

Influence Over Corporations

THE securities exchange act of 1934 is designed primarily to exert control over security trading, but in establishing this control it exercises what is expected to be an extensive influence over corporations, whose securities are listed on exchanges.

This is done by a requirement that no issues can be traded without Federal registration. Involved in registration is the supplying of certain data, covering a wide range, as the commission in "public interest" may require. Also involved is the supplying of periodical information by the corporations.

To a very much greater extent than in the case of the securities act of 1933, the exchange act provides for a control by men rather than by law. Analysis of the bill reveals that the

S.E.C., together with the Federal Reserve Board, which has charge of the credit provisions, will exercise an approximate 90 per cent discretionary power. The one really important statutory check on the commission is contained in Section 25, which provides for appeal to the courts on commission orders.

Most of the provisions of the law did not become operative until October 1, 1934, and with such a vast field the commission has been proceeding slowly in its promulgations. Control is under temporary rules and gradually permanent regulations are being prepared. It is impossible as a result, to weigh judgment on possible criticisms of excessive costs, of too elaborate detail and of infringement of the "rights" of corporations.

"Beneficial" Owners' Obligation

DIRECTORS, officers and stockholders owning more than 10 per cent of a registered company's securities are now filing with the S.E.C. the amount of their holdings and they will be required to report any changes each month. These "beneficial owners" are now prohibited from profiting from the purchase and sale of any security of the corporation within a period of six months and any such profit goes to the corporation.

Similar to the purpose of the securities act of 1933, the corporate provisions of the exchange act propose to obtain "the truth, the whole truth" from issuers, whose securities are traded.

This involves extensive details of the organization, operation and financial structure, with particular emphasis to remunerations within the enterprise. It involves regular financial statements, prepared under methods to be elaborated by the commission.

One objection, already being heard, is on making the corporate data public information. Except for "trade secrets and processes," the commission may reveal any information filed with it, although provision is made for written objections. On December 8, the commission issued a blanket order to security exchanges to make the information available, unless ordered not to do so in specific cases.

Delisting as a Weapon

THE "weapons" of corporations, in the event of disagreement over requirements is, of course, delisting

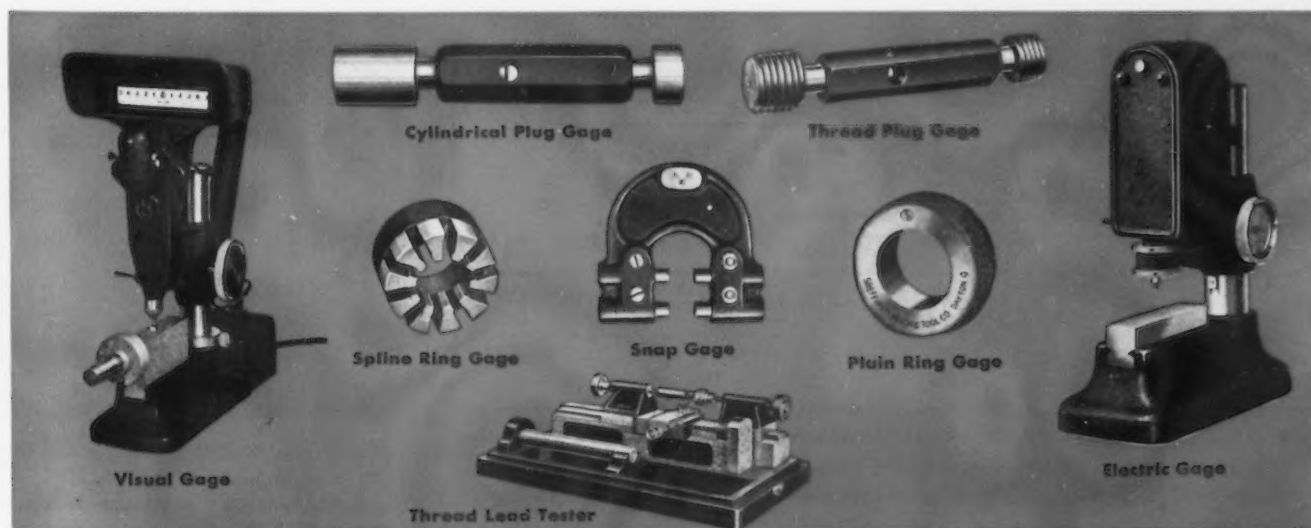
THE DESIGNATION OF A FINE GAGE



THE fine gage is the product of both art and science. It requires craftsmen especially qualified and carefully trained—men of the utmost patience and skill. A variety of special equipment is needed—equipment not found anywhere but in the master gage plant. An accurate knowledge of metals and a reliable source of this raw material is essential, together with close control of every process used to transform it into gages.

Sheffield Gages are built on these fundamentals from scientifically selected materials and on machinery especially designed and constructed for the sole purpose of gage making.

The most important element, however, is craftsmanship. The distinguishing characteristics of the Sheffield Gage is built into it by constantly striving for greater and greater accuracy.



SHEFFIELD GAGE CORPORATION

Dayton, Ohio, U. S. A.

YODER MILL EQUIPMENT



The unit shown for small pipe includes forming, welding, sizing and straightening and automatic cutoff. Will accommodate any type welder.

We build a complete line of Rotary Shears, Automobile Metal Working Machines, Metal Forming Machines and Electric Welded Pipe Equipment. Also Steel Mill Equipment including Decoilers, Slitters, Edge Conditioners, Roller Levelers, Recoilers, Automatic Cutoffs, Roller Tables, etc.

Consult our engineers on your sheet or plate problems

THE YODER COMPANY
W. 55 ST. and WALWORTH AVE. CLEVELAND, OHIO
PLATE AND SHEET METAL MACHINERY SPECIALISTS

from exchanges of their securities. After permanent registration, however, delisting can be restricted by rules of the commission. Federal control of security markets became effective with full cooperation between the corporations and the commission. There was no major company which refused to comply, and the trading list remained practically unchanged. Corporation heads, exchange officers and commission members have joined

forces to work toward a practical administration, capable of guarding against abuses but restricted enough not to disrupt one of the most important activities in the country.

In a field so complex as government regulation of security issuance and trading, conclusions are difficult. The key to any answers is the administration by the commission. There are indications that the S.E.C. is making the cooperative efforts of business

and the Administration not merely one of words. Suggestions, it has been shown, receive careful consideration and great stress is being laid in the desire to remove all "legitimate" opposition. Much still remains to be done.

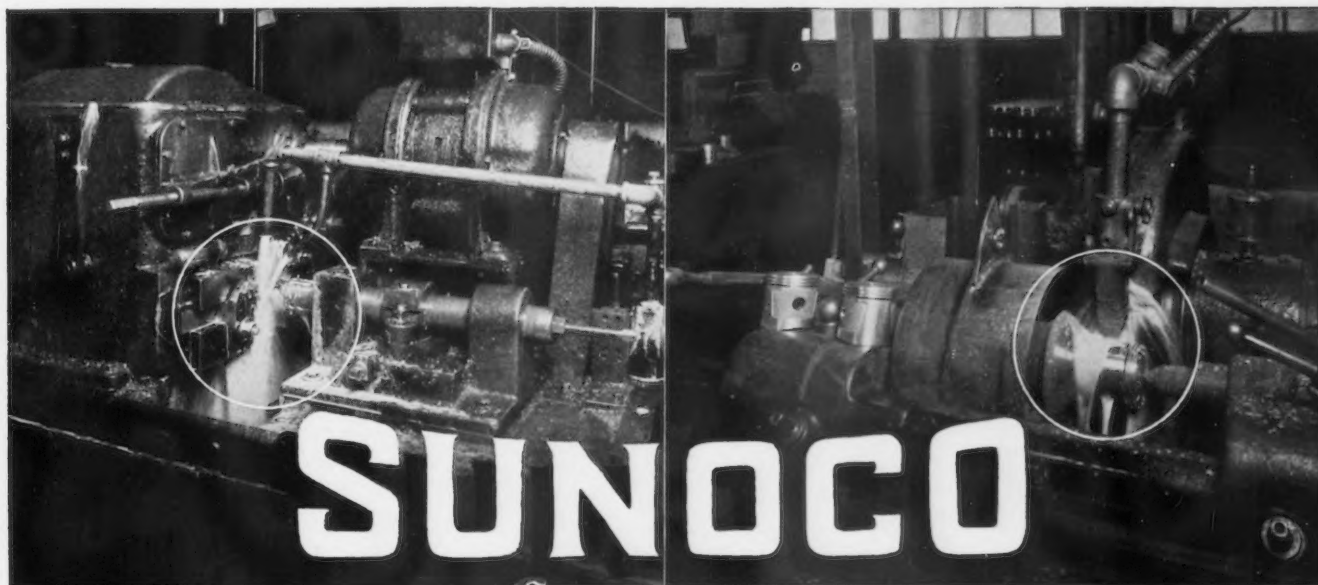
The contention that the securities act of 1933 goes beyond the English Companies Act in penalties imposed is being accepted more generally and it appears that attempts are being made to follow the principles of the older English law more carefully. There have been fewer "straitjackets" in the operation of the exchange act than was predicted. With pledges made and with indications that "recovery" is no longer to be repeatedly subordinated to "reform," there is less fear of laws, which, not very long ago, were characterized in some quarters as capital market and security trading "public enemies."



CAPTAIN FREDERICK HELLWEG. Superintendent of the Naval Observatory, is shown with his recently completed time comparer and broadcaster. With this, it is possible to obtain the most accurate time in the world by dividing the seconds into a thousand parts. An hourly broadcast from Washington, recently inaugurated, gives this accurate time to all radio listeners.

Chosen

**... By Leaders in the
Metal Cutting Industry
... for Fast, Accurate
Production Runs!**



Emulsifying **CUTTING OIL**

• **Step Your Machines Up to Rated Capacity with Sunoco**

The high speed, flexibility and fast metal-removing capacity of modern machine tools are utilized to their fullest extent only when a cutting oil of known quality and proven worth is used.

With Sunoco Emulsifying Cutting Oil, increased machine speed, longer runs per tool grind, less lost time for resetting, greater accuracy and better finish are made possible.

• **Protects Against Skin Infections**

Sunoco is hygienic. Bacteriological tests prove that it will not permit the development of pus-forming bacteria, or pathogens which cause skin inflammation.

We suggest a test in your own plant under your own operating conditions. Our cutting oil engineers will gladly work with you.

SUN OIL COMPANY • PHILADELPHIA

Offices and Warehouses in more than 100 Cities
Subsidiary Companies: Sun Oil Co., Ltd., Montreal • British Sun Oil Co., Ltd., London, England

The Operations Shown
(At left)
Courtesy of Diamond Screw Products Co., Detroit
Operation: Automatic nut blanking
Material: Cold rolled steel
Speed: 4000 r.p.m.
Production: 350 to 500 pieces per hour
Lubricant: 1 part Sunoco to 15 parts water
(At right above)
Courtesy of Ray Day Piston Corp., Detroit
Operation: Finish grind aluminum piston
Machine: Landis Grinder
Wheel Speed: 1300 r.p.m.
Work Spindle: 225 r.p.m.
Stock Removed: .015 inch
Coolant: 1 part Sunoco to 50 parts water



(CONCLUDED FROM PAGE 126)

Solution of the long existing problem of final finish for die cast products reached a point where, when finish is the important factor, the selection of the alloy to be used can be determined by the nature of the finish desired or required—kind, quality, and cost considered. This development largely reduced, and in many cases

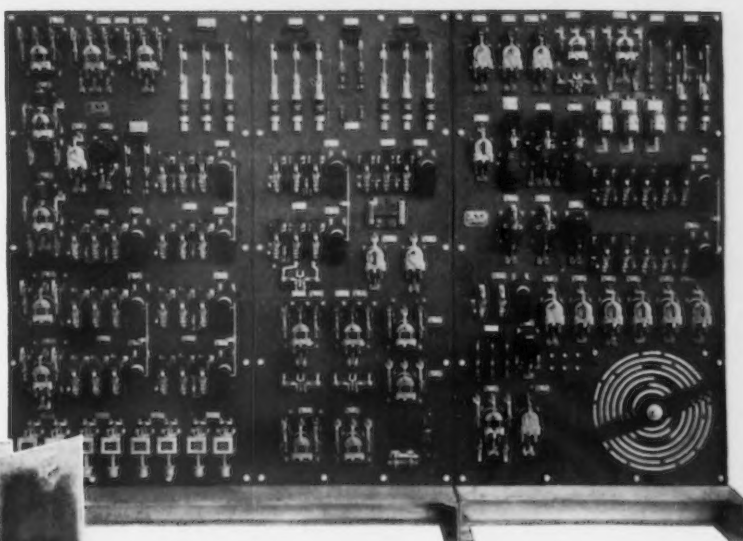
Although nickel consumption cannot be traced to its final destination, the following figures do give a fairly accurate picture of the distribution of nickel according to products. The distribution for 1926 and for 1934 is also compared. It can be seen that the base of world consumption has been definitely broadened since 1926, when three categories of nickel applications accounted for 74 per cent of the total. In these tables, percentages do not represent actual tonnages, as current consumption is approximately twice as great as it was in 1926.

	1926 Per Cent	1934 Per Cent
Alloy steel used in motor cars, trucks and buses	36	20
Nickel silver and nickel copper alloys for a multitude of uses	18	18
Pure rolled nickel in the form of rods, strip, wire, and tubes, used largely in the radio, in the chemical industries and for coinage	10	17
Alloy steel, inclusive of stainless steel, used in railroad equipment, farm implements, general machinery and numerous miscellaneous applications..	1	15
Nickel for plating and as undercoat in chromium plating	5	10
Monel metal used for many engineering purposes and for household equipment	20	9
Alloy cast iron—castings of all kinds	1	4
Miscellaneous uses including magnetic alloys, nickel brasses, nickel bronzes, nickel aluminum alloys and white gold	4	4
Heat-resistant and electrical alloys ...	5	3
	<u>100</u>	<u>100</u>

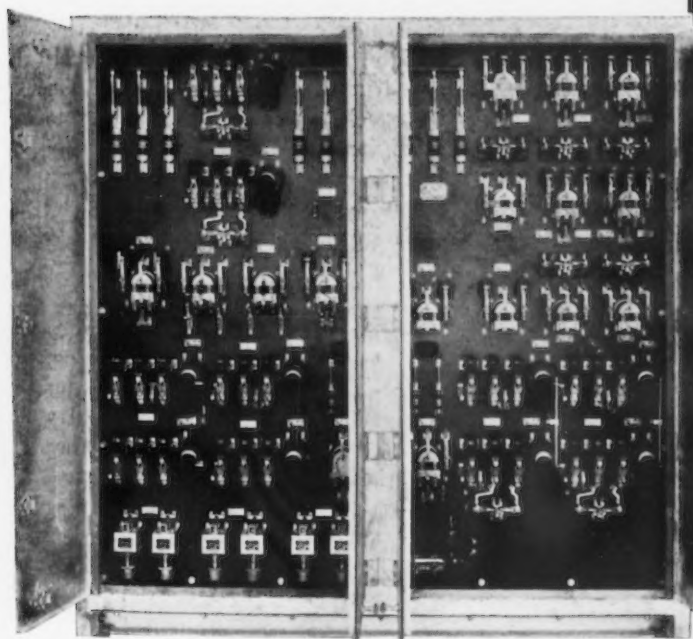
CLARK..

AUTOMATIC STEEL MILL CONTROL EQUIPMENT

While it is true that these illustrations show Clark Automatic Control Panels built for a specific application, the real purpose of this pictorial message is to show that CLARK is completely capable and fully equipped to design and build all standard or special A.C. and D.C. Automatic Control for any auxiliary motor drive in the Steel Mill or other Industrial Plants.

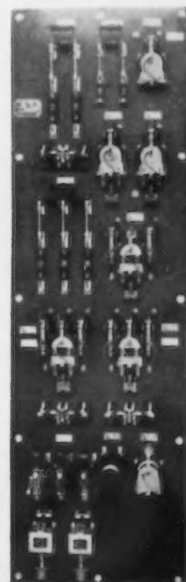


Above is a CLARK Automatic Panel operating Roller and Catcher Tables and Automatic Screwdown on Roughing Mill by Mackintosh-Hemphill Company.



Above is a CLARK Automatic Panel operating Roller and Catcher Tables at Finishing Mill, Double Pack Furnace Doors, blowers and conveyors by Wean Engineering Company.

Below are shown some of the accessories, developed by CLARK, to meet special requirements.



THE CLARK CONTROLLER CO.

1146 East 152nd St.

CLEVELAND, OHIO



A Plea for Consideration of Old Age Pensions

The present Congress is expected to take up the question of Federal Old Age Pensions. Enactment of such an act would be a momentous step in the social legislation of the country, and every detail should have careful consideration by the Congress.

Thousands of citizens should carefully consider another aspect of relief for the aged and infirm, should meet a situation that cannot be handled by Congress, but only by its constituents,—the need for replacement of old, worn-out, obsolete forge shop equipment.

By actual census, hammers have the greatest average age of all classes of machinery. By some odd turn of mind the average opinion seems to be that as long as the ram moves up and down, "it's a hammer, and doing all any hammer can do." It isn't so. Age takes its toll. Wear has resulted in inefficient, wasteful operation. Advances in design and materials have made most hammers obsolete, not profitably productive. You can best utilize your investment in materials, wages, and power, only with Erie Forge Shop Equipment. Retire your aged and infirm; the increased earnings with new Erie equipment will pay the costs.

ERIE FOUNDRY COMPANY. ERIE, PENNA.

Steel Producers Win New Markets

(CONTINUED FROM PAGE 54)

several large presses of welded construction having been built during the past year.

The electric traveling crane industry is showing a marked trend toward the greater use of rolled steel for which the art of welding may be given credit.

Welded rolled steel is now quite commonly used in the construction of heavy mill equipment. One of the most recent examples is found in the

arc welding of a steel frame for a reversing blooming mill engine built by the William B. Pollak Co., Youngstown, Ohio, for the Laclede Steel Co., Alton, Ill. Redesigned for arc welded construction the right and left sections each weigh 34,000 lb. Of the total weight of 68,000 lb. approximately 12,400 lb. is in cast steel and the remainder in plain open-hearth steel, 0.20 per cent carbon. The rolled steel is 1½ in. plate throughout. Built in the conventional manner this unit would weigh 1½ times more. Strength, it is claimed, was increased two to four

times by using welded steel. The overall dimensions of each unit are 25 ft. 3 in. long, 6 ft. wide and 5 ft. 6 in. high. Welding equipment for construction of this frame was supplied by the Lincoln Electric Co., Cleveland.

The use of rolled steel in the manufacture of Diesel engine frames and crank cases used for high-speed streamline passenger trains is one conspicuous example of the broadening of the application of steel that has been made possible by welding.

The use of welded rolled steel has gained rapidly in the motor field. Some manufacturers are making housings for motors of 40 hp. and larger of welded material, and motor stator frames down to 1-hp. units are now generally fabricated of welded steel. The Lincoln Electric Co., Cleveland, by various redesigns is now using only 3 or 4 lb. of cast parts in the manufacture of an arc welding machine weighing about 1500 lb.

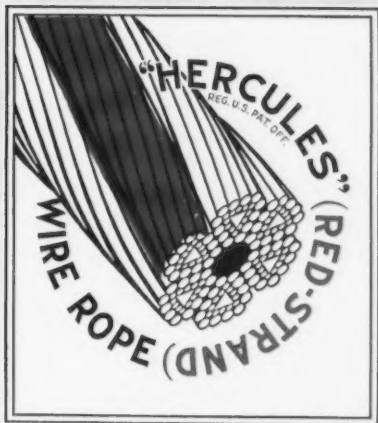
Steel Containers

Use of steel containers in the food and other industries in manufacturing processes and for shipment of products continues to expand, and besides offers new outlets for flat rolled steel, rapidly replacing wood for barrels and drums in some industries. Stainless steel has contributed largely to expansion in these fields. The stainless material is now largely used in the milk-processing industry because of its resistance to corrosion and to discoloration and its ease in cleaning.

Its application in some food industries where it heretofore has not been used to much extent is broadening. Stainless steel is replacing wood for vats and tanks in the cheese industry and is being used in place of other materials for cookers and evaporators.

Several manufacturers are now making lacquer-lined steel barrels with removable heads that are replacing wooden barrels for shipping lard, shortening, condensed milk, syrups and other food products, these being made in sizes of from 25 to 60 gal.

The use of drums of stainless and stainless clad steel for shipping food has also grown quite rapidly. The Stevens Metal Products Co., Niles, Ohio, recently manufactured stainless steel barrels for shipping syrup to bottling plants to be used in making soft drinks. The Ingersoll Steel & Disk



Consider Its Record!

After all is said and done—results are what count, and that is why we ask you to consider the actual service record of "HERCULES" (Red-Strand) Wire Rope.

"HERCULES" is economical because it is extra long lasting, and its long life is not a matter of chance or guess but the result of definite and specific causes—developed by us during our seventy-eight years of rope making.

Another important factor is that "HERCULES" (Red-Strand) Wire Rope is made in a wide range of constructions. If you will tell us how you use wire rope, we shall be glad to suggest the type we consider best for your particular work.

Made Only By

A. Leschen & Sons Rope Co.

Established 1857

5909 Kennerly Avenue - - - St. Louis, Mo.

New York - - - - - 87 to 90 West Street

Chicago - - - - - 810 W. Washington Blvd.

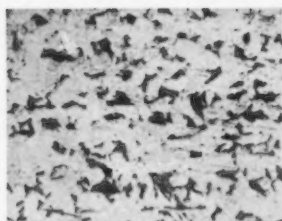
Denver - - - - - 1554 Wazee Street

San Francisco - - - - - 520 Fourth Street

WYCKOFF

Controlled

MANGANESE STEELS



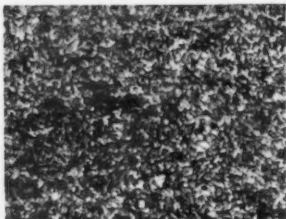
Uncontrolled Steel — magnification 67 x—etched.



Wyckoff Controlled Manganese Steel as rolled — Magnification 67 x—etched.



Uncontrolled Steel, cooled rapidly in air from 1900° F.



Wyckoff Controlled cooled rapidly in air from 1900° F.

In a recent series of tests conducted by a large eastern manufacturer, interested in obtaining a steel that would give maximum results in both uniformity and machinability, Wyckoff Controlled Manganese Steel, proved conclusively its superiority over the steels heretofore used as shown in the illustrations above.

In these tests, the superior machinability of Wyckoff Controlled Man-

ganese Steel and its close grained structure were outstanding. After machining, it was further subjected to heating in Cyanide at 1450° F. and quenched in oil, definitely proving that its fine grain characteristics insured the MINIMUM amount of distortion.

Investigate Wyckoff Controlled Manganese Steel!

WYCKOFF DRAWN STEEL COMPANY

General Offices: First National Bank Bldg., Pittsburgh, Pa.
Mills at Ambridge, Pa. and Chicago, Ill.

Manufacturers of Cold Drawn Steels

Turned and Polished Shafting

Turned and Ground Shafting

Co. has brought out a steel ply drum for the transportation of food syrup, toilet preparations and other products.

For transporting flour in bulk for less-than-carload shipments a battery of six all welded tanks of U.S.S. Plykrome stainless clad steel recently were built by Alloy Fabricators, Newark, N. J. Flour will be delivered to the store in these containers and put in racks for retail trade. These tanks with a stainless steel inner surface are corrosion resistant, clean and sanitary. The tanks have

compressed air attachments permitting their unloading by that means if desired. This method of bulk handling is said to be economical and opens up a new field for containers with wide possibilities, as the tanks may be used for transporting various food products, dry chemicals and numerous other articles.

The use of small tin cans for containers of motor car lubricating oils that are filled at the oil refineries, providing a sealed package for delivery to the consumer, has grown

rapidly the past year and increased considerably the consumption of tinplate. The oil cans are made in sizes of from 1 to 5 qt.

The steel beer barrel came in with the repeal of prohibition in 1933 and during that year approximately 1,500,000 barrels of plain and stainless clad steel in sizes of one-eighth to full barrels were manufactured. Many barrels were also made of aluminum. The demands of the revived brewing industry and the inadequate supply of white oak for barrels enabled the steel beer barrel manufacturers to sell large quantities of barrels. The demand dwindled when breweries became well stocked with barrels, and the steel barrel production dropped in 1934 to approximately 360,000 barrels.

The steel barrel industry appears to be on a firm footing and has an association of 13 members, which includes all the leading manufacturers. A bitter fight against the use of steel beer barrels, an open shop product, is being waged by the Coopers Union, which is causing some sales resistance.

Pressed steel cases for beer are now made by several manufacturers and are being received with favor as a substitute for wooden cases.

A tin can container for beer to replace bottles has been developed by the American Can Co., but this still is in an experimental stage under laboratory tests which are expected to be completed early this year.

Another new use of steel in the brewing and other industries is in the manufacture of rectangular storage tanks made of plain or corrosion-resisting steel built in individual units or stacked in layers mounted on an I-beam frame with a space between the tank and its supporting members filled with concrete.

Perforated Metal

Stainless clad steel is replacing wood in some food industries for floor plates and stair treads. Plain steel has not been used because of chemical action caused when certain products came in contact with the steel. Also stainless clad pipe, with a coating of the stainless material on the outside or inside as required, is being used in applications for which ordinary steel pipe is not satisfactory because of its inability to resist corrosive action.

Many new applications are being

found for the use of perforated steel and other metals. This is now made in numerous ornamental patterns, and for decorative purposes it is being supplied with a chromium finish, although it can be given any desired finish. A recent application is its adoption by upholsterers for bottoms of couches and davenports to support the springs, taking the place of burlap and other materials.

The perforated metal is used in considerable quantities for grilles, sterilizing cabinets and machinery guards. One pattern in galvanized steel is widely used as a sanitary flooring in poultry coops and rabbit hutches. One manufacturer has brought out a new type of perforated metal for screening and sizing bulk material.

Kitchen Equipment

In modernizing the home, steel is taking a commanding position and its use in this field is now taking a substantial quantity of flat rolled material. Various new products are being brought out, both in the stainless grades and in porcelain enamel and other finishes for kitchen equipment. At least two manufacturers recently brought out a combination sink and cabinet of pressed steel having drawers and cupboards beneath the porcelain enameled sink.

Other new pressed steel products for the housewife include a kitchen utility cabinet, a combination sink and laundry tub, a separate laundry tub unit, two pressed steel laundry tubs mounted on a steel base and designed to take the place of the stone tubs commonly used in the laundry. One company is about to start the manufacture of steel kitchen cabinets in various standard sizes, permitting the home owner to purchase a cabinet that will fit in the available space in the kitchen and replacing the common wood and glass cupboards.

Pressed steel vitreous enameled sinks, the manufacture of which was started about two years ago, have won popular favor and these are now in volume production. These streamline sinks are only one-third as heavy as the conventional sinks, possess greater strength, and are acid resisting. Moreover, the use of pressed metal allows a flexibility in design.

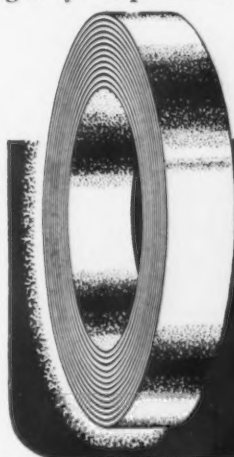
Stainless steel sinks have also won a great deal of popularity. Among the recent products in this field is a



for your product

Protect the quality of your product—protect its life and beauty of finish by the use of Thomastrip specialized production cold rolled strip steel . . . Thomas improved methods of rolling and annealing assure precision in gauge and size dimensions, smooth bright finish, and uniformity in grain structure for deep drawing and forming operations . . . Thomas Electro Zinc Coating or Cadmium Coating, insures rust resistance produced more easily and less expensively, and an attractive durable finish which will not crack or flake in forming or drawing . . . Thomas Electro Copper Coating prolongs the life of dies, prevents material from rusting in stock, and provides the base for further plating operations . . . Investigate Thomastrip. A Thomas representative will gladly cooperate with you.

Test Thomastrip for your product. Send for test samples. Specify gauge, width, temper and coat desired.



THE THOMAS STEEL CO. • WARREN, O.
SPECIALIZED PRODUCERS OF COLD ROLLED STRIP STEEL

THOMASTRIP
STRIP  **STEEL**
BRIGHT FINISH • ZINC COATED
COPPER COATED • CADMIUM COATED

three-compartment sink made of 14-gage polished stainless clad steel of lock seam and welded construction which was made recently for restaurant use. It is 82 in. long, 24 in. wide and 16 in. deep.

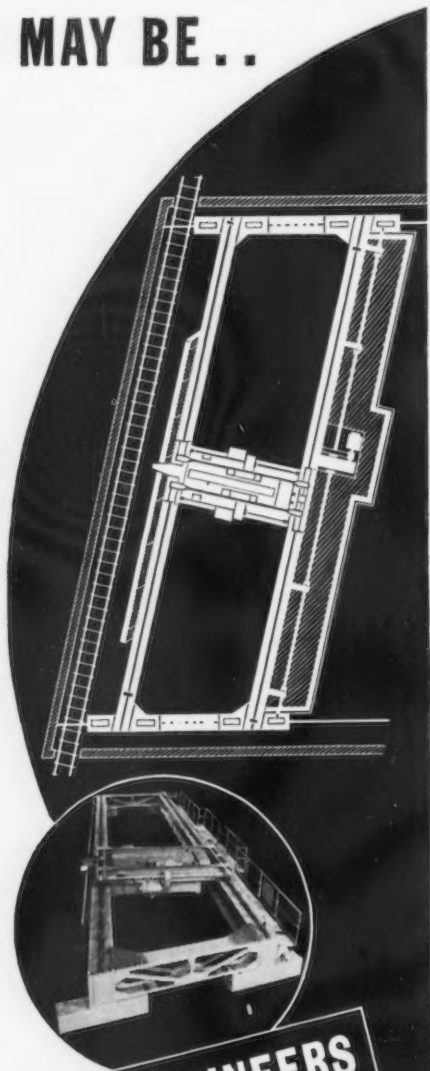
The manufacture of bath tubs of pressed steel has long been the ambition of some men in the stamping industry, but difficult problems were involved in the deep drawing operations required. However, two manufacturers seem to be about ready to get under production on pressed steel bath tubs and these, because they will take a large tonnage of steel provided

they meet with popular approval, may be one of the outstanding products of 1935.

Frameless Steel Construction

Progress was made in 1934 in the development of commercially satisfactory methods of construction of frameless steel buildings with the use of sheet metal. The Insulated Steel Co., Middletown, Ohio, with which the American Rolling Mill Co. is associated, improved its wall design, utilizing Z-shaped floor sections in smaller dimensions. This provides a flat wall surface on two sides which

WHATEVER YOUR CRANE PROBLEM MAY BE..



**P&H ENGINEERS
HAVE THE
ANSWER**

A peculiar problem faced P&H engineers in designing a crane for Plant No. 37 of a prominent auto body builder at Detroit . . . the building ended diagonally to provide for a railway spur. The answer was a "skew" crane, traveling at a 77 degree angle, enabling the crane to unload cars which are spotted at this angle. Overhead clearance was limited.

As the world's largest builders of overhead cranes, P&H offers you a wealth of experience in crane application. Ask for catalog 450.

HARNISCHFEGER CORPORATION
4401 W. National Ave., Milwaukee, Wis.

**PH TRAVELING
CRANES**

can be painted for low-cost jobs or covered with plaster board and plastered for conventional construction. The webs in the cellular walls are perforated to minimize conduction, while the cells are packed with granular wool.

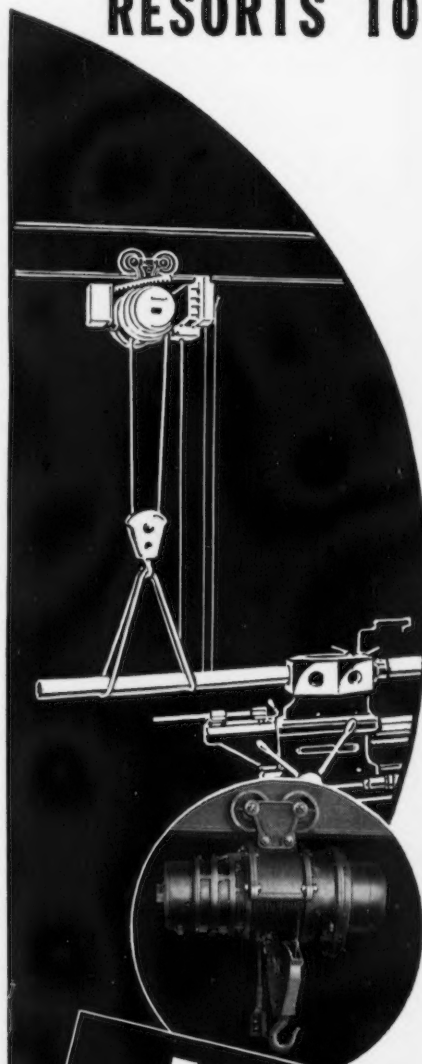
Insulated Steel improved methods in the fabricating of both the floor and the wall sections. Floor sections have been made up to 30 ft. in length possessing less than the allowable deflection. Assembly economies have been effected which, it is claimed, should make frameless steel competitive with other conventional forms of construction, at the same time offering many advantages, such as fire resistance, lightning safety and freedom from termites.

Both the frameless steel wall and floor are assembled in the factory in large sections, the size depending upon the handling convenience. The walls are delivered to the site if necessary, in two-story lengths, while the width of the floor sections is contingent upon the length of the span. Though the formed members are fastened together in the shop by means of automatic spot welding, sheet metal screws are used to join them in the field. Erection is rapid.

In the low cost field Steelex, an interlocking, self-framing panel type construction using galvanized sheets, made its appearance at the World's Fair last spring when a small farm building was built. It is the development of the Steelex Co., 59 West Austin Avenue, Chicago. Steelex is one of the simplest and most standardized forms of steel construction yet developed. A single unit, a panel with a male joint on one side and a female on the other, is the chief member used in both wall and roof. The panel and all complementary materials, such as ridges, angles, channels, etc., are made of galvanized Armco iron and steel sheets. These pieces are all formed on a brake.

This construction is said to lend itself to owner erection. A channel is embedded in an asphalt strip and bolted to the foundations. The Steelex panels are then set in place and interlocked. A channel-shaped piece then caps the wall, and hook bolts are inserted which hold the members to the wall cap and the channel below. This provides a strong, rigid wall 3 in. in thickness, which can be insulated with board or granular-type

EASTERN PIPE MANUFACTURER RESORTS TO



**FASTER
HANDLING**

The slow, laborious handling of large iron pipe, from floor to lathes with chain blocks, was responsible for a high over-all production cost. P&H Material Handling Engineers made their recommendations: Based on an average of 14 lifts per hour the P&H-Milwaukee Hoists speeded up operations by 37%.

It's just one small way in which we have served thousands of users of material handling apparatus over a period of fifty years . . . ask for catalog RH-2.

HARNISCHFEGER CORPORATION
4401 W. National Ave., Milwaukee, Wis.

**PH MILWAUKEE
ELECTRIC HOISTS**

insulating material. Furring strips can be attached to the projecting ribs on the interior side of the wall for receiving lath, plasterboard or other wall finishing materials.

In assembling the roof, the Steelox panel is set in place with the ribs on the outside, giving it the appearance of a pressed standing seam roof. It is self-supporting.

Due to the simplicity of this construction in every detail from the forming of the members to the field erection, and also to the fact that the individual members net together when packed for shipment, wide distribution is looked for in 1935 for garages, filling stations, small homes, small warehouses, farm and commercial buildings.

Store Fronts and Gasoline Stations

Rapid strides have been made recently in the modernization of store fronts by the replacement of old in-artistic and dingy fronts with bright colorful metals in pleasing design, fabricated for the most part from porcelain enamel and stainless steel sheets, and this work is broadening the field for decorative metals. Many architects and contractors are specializing in renovating commercial buildings by the construction of new fronts for stores and restaurants, and the architectural effects that are being produced are most attractive. Steel for this purpose is replacing marble, architectural glass, wood and other materials. Porcelain-enameled steel in various colors, either alone or in combination with the bright finish of stainless steel used for trimming or other decorative purposes, presents a most pleasing effect.

The use of metal for store fronts has many advantages over other materials. Metal is meeting with favor for this purpose because it permits an originality in design and flexibility in treatment and color. It also lends itself to architectural possibilities because it may be formed in various shapes and permits the construction of fronts that are not only distinctive but have an individuality. In addition, the porcelain and enameled steel fronts retain their luster.

Styles change in store fronts and another advantage of the metal fronts is that should changes in popular design develop in the course of a few years calling for new modernization it is easier to replace a front with a

Steels made with SWEDISH SPONGE IRON as a raw material show a VIBRATION DAMPENING CAPACITY TWICE that of similar steels made with scrap as a raw material. Reference: Report of Investigations, Bureau of Mines, R. I. 3229, page 63,—Obtainable from us or directly from B. M.

We represent the makers of
SPONGE IRON
and
POWDER IRON
for
Metallurgical and Chemical Use
EKSTRAND & THOLAND, INC.
122 E. 42nd ST., NEW YORK CITY
DETROIT—CHICAGO

new architectural design of metal construction than it would be were other construction materials used.

Some complaint has come from the virtually new profession, store front specialists, that a standard method is not provided for applying metal panels in store front construction, and they suggest that mills that produce metals for these purposes should develop a standard method of fastening the steel to the building with clips, strip or some other means. A simple

method, recently developed of fastening preformed metal panels to the exterior of buildings is to fit them into semi-circular extruded sections attached to the framework.

Construction of automobile service stations is closely allied with the renovating of store fronts, because the trend in both types of construction is in the same direction and the same metals are used to produce artistic, colorful effects. Porcelain-enameled sheets and stainless steel have become

PERFORATED METALS..
FOR EVERY PURPOSE

Plain and Ornamental Perforations in a great variety of sizes and styles, made in any metal.
Excellence of product and low prices.

The Harrington & King
PERFORATING CO.
5657 FILLMORE ST. CHICAGO, ILL.

BENDING MACHINES

POWER AND HAND

FOR

TUBE — CONDUIT

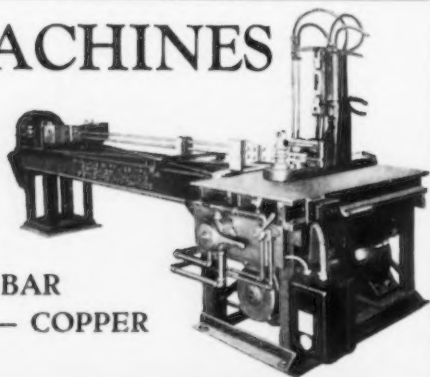
PIPE — ANGLES

SPECIAL SECTIONS

STRUCTURAL AND BAR

STEEL — BRASS — COPPER

ALUMINUM



BENDING SPECIALISTS

A GREAT VARIETY OF DIFFICULT
BENDINGS PRODUCED AT LOW COST.
CATALOG ON REQUEST

WALLACE SUPPLIES MFG. CO.

1306 Diversey Parkway

CHICAGO, ILLINOIS

popular metals to provide brightness, color and originality in the gasoline service station, and these metals are being used in increasing quantities for this purpose. In the construction of a standardized type of station adopted recently by the Standard Oil Co. of Ohio, one ton of stainless steel and 4½ tons of enamel sheet steel is used.

One of the most recent developments is the use of crimped enameled sheets in the construction of both

store fronts and automobile service stations. The use of the porcelain-enameled material in crimped form tends to eliminate excessive waves and to give a softer appearing finish, as well as to increase strength. A gasoline station just built in Cleveland, which is said to be the first to use the crimped enameled steel, is covered with 20-gage steel with 3/16-in. crimps.

For use in modernizing store fronts and also for interior applications, a

product designated as Glasiron Macotta is being produced in a wide variety of shapes and colors and finishes. This consists of porcelain-enameled Toncan enameling iron as a facing, bonded to a light-weight concrete backing which takes the building load, insulates and is fireproof. Enduro stainless steel may also be used as a facing to provide a color combination with the porcelain enamel.

Hollow metal lumber for framing and steel wainscoting and a new type of roofing are among other new building products. Another recent application of steel in the building field is the use by the Storm Flooring Co., New York, of hot-rolled strip in making mastic-set wood floors. The steel in the form of strip or splines, either of saw-tooth construction with teeth affixed to the two flat surfaces of steel or of smooth steel, cement coated, is used in interlocking the sections of wood flooring. Steel clips are also used in this construction.

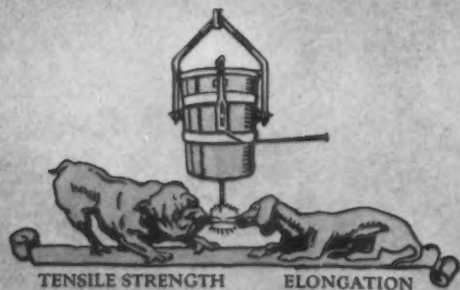
High-Speed Steel

Two new types of high-speed steel were brought out during 1934 by the Latrobe Electric Steel Co., Latrobe, Pa. One, Electrite Mo, is a high-speed cutting steel in which the greater portion of tungsten has been replaced by molybdenum. This steel hardens at a temperature slightly lower than the 18-4-1 type of high-speed steel, but after a drawing at about 1040 deg. F., produces a hardness about C-65 Rockwell, which is the same as the 18-4-1 type. Another, Electrite No. 19, is of the 18-4-2 type, which has been produced to give better cutting qualities than the regular 18-4-1 type. It is stated that it can be used for all the purposes for which the latter is used, but gives longer life and cuts material slightly harder than can be cut with the 18-4-1 type.

The Latrobe company has also brought out a new high-carbon, high-chrome stainless steel used for cutlery purposes, designated as Special Lusterlite. This is stated to be a more satisfactory material than the company's regular stainless steel in that it produces a product of greater hardness. It also takes a fine mirror finish.

Another steel brought out by the Latrobe company is for making dies for die casting aluminum and is des-

STRONG STEEL CASTINGS



Strong Steel Foundry Co.

Buffalo, New York

ignated as Dy-Cast No. 1, being a less expensive material than its Lumdie grade.

Non-Railroad Applications of High-Tensile Steels

Applications of USS high-tensile steels outside of the railroad industry include the following: Cor-Ten steel—automobile bodies, dough-mixers, roofing, oil tanker construction, smoke stacks, ventilators; Man-Ten steel—automobile bodies, dredge line booms, dredge and excavating buckets, cranes, dredging equipment, excavating equipment, molding board for snow plow, ship construction, side chains.

Toys

The use of steel in the manufacture of toys is increasing and, while many toy plants consume only small quantities, some contract for 400 to 500 tons for a quarter. This is made up mostly of sheets, strip and tubing. Considerable tonnage of sheet seconds is utilized by toy manufacturers. Tin plate and tin mill black plate are also used. Some manufacturers are now buying chrome and nickel-plated sheets.

Miscellaneous Products and Uses

Acid-etched nails recently were introduced for use particularly in nailing boxes and crates. Some complaint that wooden packages break open during shipment came from transportation companies and the new nail, designed to hold better than a common smooth nail, was developed by the American Steel & Wire Co.

Another new product in this field is a screw shank nail or drive screw used for fastening metal to wood or to other materials and for applying composition roofing. Steel wire cases, electrically welded, are replacing wooden milk bottle cases, and wire dividers are taking the place of wood in wooden cases. One manufacturer is bringing out a stainless steel wire screen for doors and windows for use in certain volcanic areas where copper screening is affected by atmospheric conditions.

Shower bath cabinets are now being made of sheet steel. Attractive appearing flower baskets are another new pressed steel product. Wood card tables are being rapidly replaced by steel, and folding legs for these tables now are usually made of steel instead of wood. An all-steel welded cylin-

LANCASTER
*Malleable
Iron Castings*
A DEPENDABLE METAL FROM A
DEPENDABLE SOURCE
Specify
LANCASTER MALLEABLES

LANCASTER MALLEABLES & STEEL CORP.
LANCASTER, NEW YORK — SUBURB OF BUFFALO

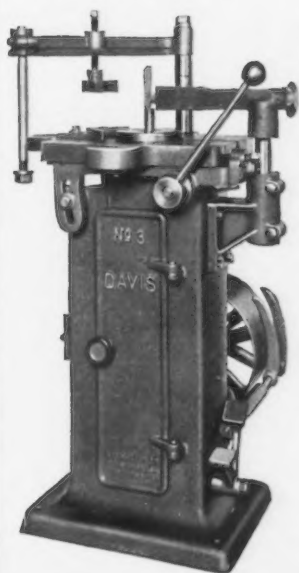
drical telephone booth with sliding door of sheet, angle and glass construction is a recent product of the Sherron Metallic Corp., Brooklyn, N. Y. While the design is standard, it will be made in a variety of finishes.

House heating and air-conditioning equipment has created new demands for steel. The use of automatic stokers for use in connection with house heating systems has developed rapidly. These stokers require sheet

steel for hoppers and other parts. Steel construction is used in a warm air furnace recently brought out by the National Steel Furnace Co., Detroit, the furnace drum and the heat radiator being of welded rolled steel.

In listing new applications of steel mention should be made of the steel top automobile body on which automobile companies will go into production shortly and which will result in considerable increase in the tonnage from automotive sources.

Reasons why you should use a Davis Keyseater:



To save using Broaching Machine on small lots.

To save using Shaper or other expensive machine.

To save time of high-grade mechanic.

Because the Davis Keyseater cuts keyways accurately and rapidly, is readily changed in set up from one job to another and can be operated by a junior mechanic.

Send for circular of our new machine with tilting table.

DAVIS KEYSEATER COMPANY
400 Exchange Street ROCHESTER, NEW YORK

Wire Forms That Fit!

E.H. TITCHENER & CO.
200-206 WALNUT ST. BINGHAMTON, N.Y.

WIRE STAPLES **ALL SIZES**

Improved Cemented Carbides Introduced During 1934

IMPROVEMENTS in the material itself and wider application in both cutting tool and die work are reported by one prominent maker of cemented carbide in reviewing the past year's developments in that field.

The company has made available several new grades which show a marked improvement in performance. One of these is for general-purpose application on cast iron, non-ferrous and non-metallic materials, and an-

other is for precision boring operations on steel. A third new grade is for light cuts on cast iron and non-ferrous metals, and is offered particularly for use where high speeds and maximum tool life are required. For heavy hogging and interrupted cuts on cast iron and some non-ferrous metals, an improved grade having greater strength and higher resistance to abrasion than the material which it replaces was also brought out. One successful application of this grade is said to be in the threading of cast iron rolls.

During 1934 there has been an increase in number of orders for multiple-tool heads and adjustable cutters for operations combining boring, reaming, facing, etc., such tools now representing a substantial percentage of the company's total output. A new general-purpose milling cutter has been developed to permit economical use of cemented carbide in small-quantity, diversified milling operations.

A majority of wire, rod and tube mills is said to be using carbide dies. In bar mills, use of shape dies has been extended to include shapes up to 1¼ in. and also to produce ovals, keystones, squares, etc. Tube mills have placed orders for dies as large as 2½ in. In the bolt and nut industry rapid progress has been made in the application of carbide extruding dies and nut burnishing dies. There has also been an increase in the number of carbide dies for forming and sizing sheet metal parts, such as shells, eyelets and safety pin heads.

For wear-resistant purposes, cemented carbide is now used on valve stems and seats, nozzles, wire guides, gages, centerless grinder rests, lathe and grinder centers and other machine parts. The manufacturing technique of the company's diamond-impregnated material has been improved, and grinding wheel truing tools made of it may now be used on grinding wheels of practically all types, sizes and hardness.

To the Chief Engineer

WE have for many years been in the business of supplying lamplocking devices that prevent the unauthorized removal of lamps. That practice has become so universal that we find that it constitutes a real problem in the majority of industrial plants, public buildings, railways, and so on.

WE have just perfected our 1935 model which meets the test of some fifty odd types of sockets and consists of a small fixture that is slipped over the ferrule of the bulb and, when the lamp is burned out, is taken off and placed on the next bulb, and so on for so many times that it should last the life of the socket and give many years' service.

WE have made many thousand installations.
Write for quotations.

AMERICAN INDUSTRIAL CORPORATION
230 PARK AVENUE, NEW YORK, N. Y.

Mounting Overhead Expense Spurs Handling Progress

(CONTINUED FROM PAGE 132)

rated at 3 hp. and 7½ hp., respectively.

Reading Chain & Block Corp., Reading, Pa., has developed a new trolley for its T-rail system, increasing the diameter of the wheels, using precision bearings. The head of the trolley is flexible to take up any misalignments and also swivels. Another item in the company's new line is an electric hoist using anti-friction bearings on the worm and drum shafts, eliminating the bronze bearings and making the worm case oil tight. A truss-bar construction on the company's T-rail system has also been developed and recently an installation of this type was made in the Pennsylvania Railroad station at Newark, N. J.

Floor Operating Equipment

THERE has been an unusual amount of activity in development work in the floor operated types of handling equipment, which, due to their flexibility, have fitted apparently more readily into changed handling operations of the depression period. Both gas-powered and electric industrial trucks and tractors have figured prominently in the trade press announcements of new machines during 1934. Automatic Transportation Co., Chicago, added to its line an electrical low-lift unit with rated capacity of 60,000 lb., with loading platform 40 in. wide by 96 in. long and 17 in. high. The machine was originally designed for handling body dies for an automobile manufacturer. Steering is handled by power through a d. c. motor. The machine has eight rubber-tired wheels under the load platform, these wheels being 15 in. by 7 in.

Baker-Raulang Co., Cleveland, brought out a new 3-ton unit of special design featuring streamline housing for the battery box and controls. This unit is 2-wheel drive, 4-wheel steer, and is an elevating truck with a 5¾-in. lift. The new housing is said to increase accessibility, to eliminate danger from protruding parts

Only MARVEL Blades are

**Positively
Unbreakable**

High-Speed-Edge

Among blades that offer the fast-cutting, long-lasting qualities of Genuine 18% Tungsten High-Speed Steel, only patented MARVEL HIGH-SPEED-EDGE Hack Saw Blades can be *positively unbreakable*. That is why on any sawing machine MARVEL Blades will out-cut and outlast all others, box for box. With MARVEL BLADES you can safely step up speeds and feeds. Standardize on MARVEL High-Speed-Edge Hack Saw Blades for increased production, lower sawing costs and greater profits.

Write for
Catalog

ARMSTRONG-BLUM MFG. CO.
"The Hack Saw People"
349 N. Francisco Ave., CHICAGO, U. S. A.



and to provide greater safety for the operator. The company also added two new lines of chain-hoist fork trucks.

Mercury Mfg. Co., Chicago, can point to 1934 as the year of the great Chicago Stockyards fire. The company's plant is located directly across the street from the portion of the yards which figured in the conflagration and before the latter could be checked, the flames had leaped across Halsted Street and com-

pletely destroyed the Mercury plant. From the ashes has arisen a new and modern structure. The rebuilding was completed in remarkable time. Among the recent additions to the company's line is a new 5-ton, low-lift unit employing a hydraulic lifting system. This machine has magnetic contactor control, is fitted with a double-reduction, bevel and spur gear drive axle, has semi-elliptic spring suspension, positive, automatic overload protection and six-wheel

Schieren *lasts* Belting *longer*

Because it is SCHIEREN-IZED*

Schieren-izing is an improved process of manufacture that gives to all Schieren Belting a *Natural Glove-like Pulley Gripping Surface, Unusual Pliability for use on small pulley drives, and a Higher Tensile Strength so that belt hooks or lacing won't pull out. They are made of the finest belting leather. . . . These are features that make for the unusually long life of Schieren Belts. It is the belt with the lowest cost per foot per year.*

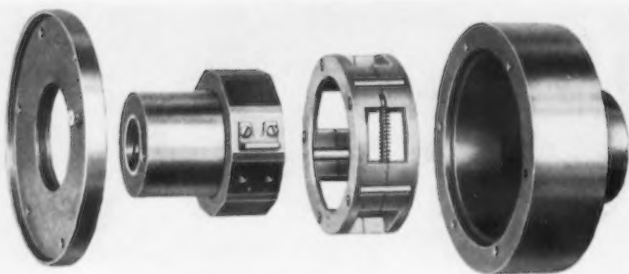


A group of 12" Schieren belts in service 31 years.



SCHIEREN-IZING makes leather belting pliable

SIMPLIFY and IMPROVE DRIVES with **FREE WHEELING**



THE new HILLIARD OVER-RUNNING CLUTCH is rapidly being adopted by manufacturers of steel mill machinery as a better and less expensive replacement of complicated driving mechanisms. It is equally useful in other fields.

It is simply constructed to a sound, trouble-proof design, and its applications are wide. May be used either as a clutch or as a coupling between two shafts. Its few parts are long-wearing and positive in action.

Let us make suggestions toward the use of the Hilliard Over-Running Clutch for your drives. No obligation. Write for Bulletin 103-A.

**THE
HILLIARD
CORPORATION**

ELMIRA, N. Y.

Clutch Makers for Thirty Years

steer. The lifting system is by means of an oil pump and hydraulic cylinder with positive overload protection.

Additions to Gas Powered Lines

ELWELL-PARKER ELECTRIC CO., Cleveland, added a gas-powered series to its line during the year. One of the first machines announced was a 2-ton lift truck. Another is a gas-powered tiering fork truck designed to handle big loads on pallets. The gas-powered, as well as the company's electric and gas-electric, machines are built on the interchangeable parts system.

International Harvester Co., Chicago introduced a new small, compact gas-powered industrial tractor during 1934. The machine measures 96 in. overall, is 50 in. in height over

the steering wheel, with a 103-in. turning radius, and with speed range from a low of $2\frac{1}{2}$ miles per hour to a high of $10\frac{1}{4}$ miles.

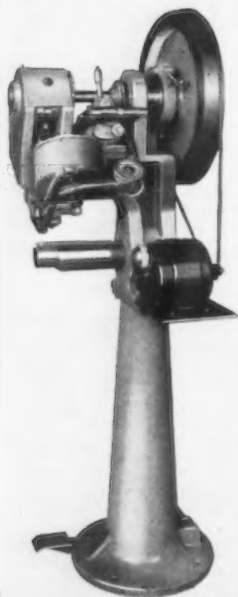
Clark Tractor Co., Battle Creek, Mich., in December announced a new small, powerful, 6-cylinder tractor in three models, known as "light," "speed" and "heavy." The light machine is designed for general industrial service in and about manufacturing plants and warehouses; the speedy machine is primarily for service in airports, country clubs, hangars and other similar establishments; the heavy is equipped with either solid or pneumatic tires and is for use in all industrial work. This new tractor is equipped with a truck engine and the company states that it is the first in-

dustrial tractor built that produces a pound of drawbar pull for every pound of tractor weight. The engine develops 46 hp. at 1800 r.p.m., has a $3\frac{1}{8}$ -in. bore and $4\frac{3}{8}$ -in. stroke. Other specifications of this new machine are: velocity type governor, standard automotive radiator with 5-gallon water capacity; single dry plate type clutch; Clark selective transmission; standard automotive control; gravity feed 6-gallon tank; down-draft type carburetor, standard cam and lever type steering gear; Clark double reduction spur and bevel gear type rear axle and Clark standard automotive truck type front axle; semi-elliptic chrome vanadium-steel front and rear springs; internal expanding type brake on rear wheels; hand-operated service brake. Standard equipment tires are: pneumatic rear, 28 in. x 6 in.; pneumatic front, 21 in. x 6 in.; solid rear 28 in. x 8 in.; solid front, $21\frac{1}{8}$ in. x $3\frac{1}{2}$ in. The machine has complete electrical equipment and an eye coupler as standard.

Colson Co., Elyria, Ohio, has added to its line a wheeled lift jack and semi-live skid, constituting a companion unit. The jack is of welded steel construction. The skid has wheels at one end and legs at the other and is available with a steel framework and either a steel or a wood platform and with either plain or rubber-tired wheels. The jack engaged a pin on the end of the skid, and is fitted with a guide plate so that the pin and socket can be registered without trouble. The socket revolves on a ball thrust bearing. The wheels are provided with annular ball-bearing hubs. When the jack is in place the load is lifted by pressing on the foot lever. When the load is

Hydro-Mechanical Squeeze Riveter

developed to replace hydraulic
or pneumatic machines.



100% FLEXIBILITY—The dies may be stopped at any point of die travel. The last third of die travel has uniform pressure which automatically takes care of variations in thicknesses of work.

100% TONNAGE ADJUSTMENT—Tonnage may be adjusted at will from zero to maximum capacity of the machine.

100% AUTOMATIC—Automatic feed is furnished on riveters for feeding and driving small as well as large **SOLID** iron, brass, or aluminum rivets automatically.

100% SAVINGS—The small power consumption, safety against accidents and tremendous production effect unusual savings.

**NORIN ENGINEERING
COMPANY**

355 Union Park Court

Chicago, Ill.

on the jack, the latter locks and will not release the load until the foot lever is tripped. When not in use the jack stands in an upright position.

New "Safety" Stacker

LEWIS-SHEPARD CO., Watertown, Mass., has added several items during the year, including a new "Safety" barrel stacker and portable elevator and a carboy hand truck with pneumatic tires. The new stacker is provided with double hinges, both high and low, so that it may move under beams, low ceilings and through doorways with low overhead. The machine can be equipped with holding strips on the platform to prevent a barrel rolling off. It can also be furnished with a turntable in the platform to permit turning of drums, and with removable rollers for handling cases.

The Metzgar Co., Grand Rapids, Mich., filled out its line of end-wood truck wheels by adding a light-duty and a super-heavy duty wheel to its other styles. In the light-duty type of wheel, the company makes use of a special casein waterproof glue, doing away with all metal, but in the heavy wheel it retains the metal discs and employs the waterproof glue for the joints. The company states that it has had an encouraging increase in business in 1934 and has developed a new field for its wheels for hauling seaplanes into and out of the water.

Saginaw Stamping & Tool Co., Saginaw, Mich., reports that there is a distinct trend toward standardization and refinement in the overhead conveyor field. The company has added a double-row ball bearing wheel to its conveyor line during the past year.

Barrett-Cravens Co., Chicago, states that it has added to its line during the past year a rockerrack for placing drums in position for draining; a new model lift truck for 3500 and 6000 lb. capacities, featuring high clearance and telescopic frame and ball bearings; a drain rack for filling stations and industrial plants, a new barrel elevator with capacities of 500 or 750 lb., both hand and electrically operated; a new tin-plate elevator with 3000 lb. capacity; a portable crane, both hand and electrically operated and in revolving or fixed type, with capacities from 500 to 5000 lb.;

STEEL FOR INDUSTRY

There is a BISCO Specialty for
Each Tool Steel Application

BISCO

TOOL STEEL TUBING

NON-SHRINK OIL HARDENING

Saves Weight and Machining Costs for
RING DIES—SPACERS—BUSHINGS

Shipment From Stock Up to 12" O.D. 2" Wall
Larger Sizes Available

Complete Stocks of BALL BEARING TUBING
In 52100 and 4615 Analyses

Write for Literature

THE BISSETT STEEL COMPANY

CLEVELAND

CHICAGO CINCINNATI

TUNGSTEN CARBIDE

DRAWING DIES FOR WIRE, ROD, TUBING
BOLT EXTRUSION DIES
TIPPED CUTTING TOOLS

TUNGSTEN ELECTRIC CORPORATION

BISSETT STEEL DIVISION

also a tin-plate lift-truck with 2500 and 3000 lb. capacities.

Revolvator Co., Jersey City, reports having designed a number of special materials-handling machines, including an automatic barrel dumping unit, a special elevator for handling rolls of sensitive films in a vault where working space is restricted; a furniture show-window turntable and others.

Lyon Iron Works, Greene, N. Y., reports that it has completed work on an improved design of hydraulic

lift truck which will be ready soon for announcement.

Introduces Several Developments

MATHEWS CONVEYER CO., Ellwood City, Pa., has made many interesting contributions to progress during 1934. Included in special designs are the following: A lifting table for an automotive engine manufacturing plant, which serves to lift cylinder head castings ready for machining to the elevation of machine roller bed, the unit acting as a stop,

SUTTON ENGINEERING CO.

PARK BUILDING

PITTSBURGH, PA.

Manufacturers

STRAIGHTENING MACHINERY

of All Kinds

Tube and bar straighteners, sheet levelers, hot and cold bar stretchers—Automatic shearing and straightening units, also rod polishing machines, one and two way flat and shape straighteners—Mechanical hammers—Corrugating machines and other special mill and factory equipment.

ANNOUNCEMENT

Revolutionary improvements in bar and tube straightening machines guaranteeing a larger range of sizes on one machine and **END TO END STRAIGHTNESS.**

Write for general arrangement drawings for patented **DISC-TYPE ROD AND TUBE POLISHING** machine—for the fastest **AUTOMATIC CUTTING-OFF AND STRAIGHTENING** equipment (from coils) and for the new B and C patented bar and tube straighteners.

SUTTON ENGINEERING CO.

PARK BUILDING, PITTSBURGH, PA.

See Advertisement Page 481

holding castings on a storage conveyor line and expediting operations; a tilting device to receive coiled steel, overcome the impact and tilt the coil off the conveyor rollers to skids from which coils are fed to mill or pickled, as the case may be; a telescoping conveyor section which is a combination of gravity roller and wheel conveyors so arranged as to be fitted between stationary dock conveyors and a portable ship-unloading conveyor, thus compensating for the list of the ship and for tide variations; a unique

type belt conveyor; a belt conveyor compressor unit for sealing paper bags, permitting a high rate of production with assurance that each bag seam will be thoroughly sealed; new high-speed rollers; a sanitary roller conveyor redesigned to include a hexagonal axle; a sanitary roller conveyor with a newly developed friction type bearing to withstand excessive corrosive action.

The new type belt conveyors are known as Type 900 and are applicable wherever package-handling is the

task. All moving parts are mounted on anti-friction ball bearings. Belt take-ups are not required. Small end pulleys permit close connection with production machines, work tables or other fixtures. Where packages transfer at right angles from one belt to another, the terminal structure is neat and compact. A maximum effective tension with a minimum total belt tension is claimed with the Mathews tandem drive, which is mounted underneath the frame of the conveyor. The design is particularly adaptable to areas where space is at a premium.

Standard Conveyor Co., North St. Paul, Minn., reports four improvements in its line, a hexagon shaft in its roller conveyor, a chain-driven live roller curve, a 4-way flex chain with open top and a 4-way flex chain with closed top. The hexagon shaft performs two important functions. The cone of the inner race of the bearing is broached hex-shaped to fit directly onto the corresponding faced shaft, preventing the inner race from turning on the shaft and insuring long life and a continuous even surface of the rollers. The chain-driven live roller curve used the Standard 4-way flex chain for power transmission. The chain travels in the channel below the rollers and the contact between these two parts produces the actuating action. A "floating power" effect is obtained by slotting the frame in which the shafts are guided and thus the rollers really "float" on the chain. The weight of the live load on the rollers increases the pressure between rollers and chain, automatically providing the correct pressure necessary to actuate the rollers. The new 4-way flex chain is said to permit of almost unlimited flexibility in conveyor installations. The links consist merely of double "U" shapes, with the ends machined to accommodate "T"-shaped lugs which form the pivot for flexing. A link or two can easily be removed by hand, no tools being required. The ends of the links are rounded and overlapped so that a continuous flush surface without gaps between links results. In the closed-top style, the top surface of the link is entirely closed to present a full, smooth surface with all edges slightly rounded. The chain can travel around a smooth sprocket in any direction.

(CONCLUDED ON PAGE 281)

CARBOLOY,*

AN ULTRAHARD CUTTING AND WEAR-RESISTANT METAL

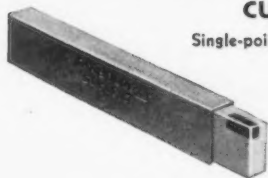
CARBOLOY cemented carbides are a series of extremely hard, long-life metals, consisting principally of tungsten, tantalum, or titanium carbides, or a combination of these or other special carbides. They have established a new, higher order of performance in all of the following fields of use: (1) As a tool material for machining all types of ferrous, nonferrous and non-metallic materials; (2) as a die material for drawing and

extruding operations; and (3) as an abrasion- and corrosion-resistant material for use on tools and parts subject to rapid abrasive or corrosive wear.

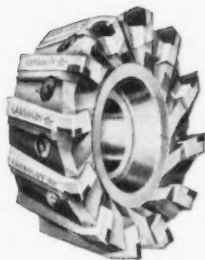
High cutting speeds, long periods between grinds, ability to machine heretofore nonmachinable metals, and extremely long life are among the benefits obtainable by the use of Carboloy cemented carbides. A few representative tools and applications are shown below.

CUTTING TOOLS

Single-point tools for turning, boring, and facing operations



Carboloy-tipped single-point tools are available in five standard styles and in any special style to meet your requirements on turning, boring, and facing all ferrous, nonferrous, and nonmetallic materials. Catalog upon request.



Solid and adjustable milling cutters

For high-quality finish, high-speed milling, Carboloy-tipped cutters are supplied in both solid and adjustable styles. Blades available for all makes of face mills. Standard Carboloy 5-in. general-purpose face mill illustrated is priced at \$85.00 complete.

Solid and adjustable reamers and boring tools

Where long tool life, high speed, accuracy, and economy are desired, Carboloy reamers give excellent results. Carboloy-equipped solid and adjustable cutters of all types are available.



Spiral and flat drills

Carboloy-tipped multiple-fluted spiral drills for rough and finish drilling on cast iron, brass, fiber, etc. Flat drills for concrete, tile, and brick. Special drills for glass and glazed porcelain.

Form and grooving tools

Carboloy-tipped flat and circular form tools, and grooving tools, insure extreme accuracy over long periods of use.

Spotfacers, counterbores

Any style of Carboloy-tipped spotfacers, counterbores, combination drills and counterbores, etc., is available to meet your exact requirements.



DRAWING AND EXTRUSION DIES

Carboloy dies for drawing and extrusion operations obtain a higher quality of finish, closer tolerances, larger bundles, and more economical die life over long periods of operation. Excellent results on wire, rod, tubing, and shaped work. Carboloy dies are available in the form of rough molded or drilled nibs, unmounted, or mounted in steel casings, and in completely finished form ready for use. Carboloy-equipped mandrels supplied for tube drawing.



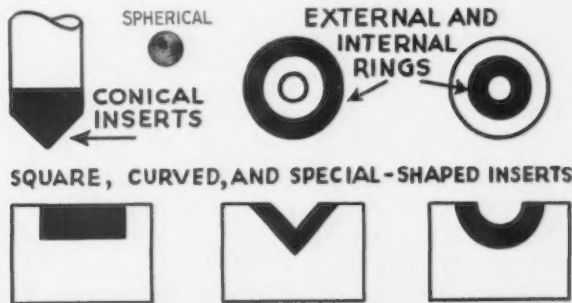
DIAMOND-IMPREGNATED CARBOLOY TRUING TOOLS, LAPS, GRINDING WHEELS

A special Carboloy diamond-impregnated material is being profitably applied in several fields of use. Most extensive is its use for truing all types of grinding wheels where, as a substitute for the single diamond in ordinary mounting, it produces a high-quality finish with more economical tool cost. No remounting necessary. Just a quarter turn of tool in holder daily presents a new cutting face throughout life of the tool. Special uses of this material include glass laps, center laps, grinding wheels for hard steels, drills for glass, etc.



CARBOLOY ABRASION- AND CORROSION-RESISTANT INSERTS

The problem of rapid abrasive or corrosive wear on your tools or machine parts can be, in most cases, entirely eliminated simply by brazing in a small insert of Carboloy cemented carbide at the point of wear. Gages, lathe and grinder centers, work rests, nozzles, valves and valve stems, and machine parts subject to rapid wear are among the tools and parts on which Carboloy may be applied to resist wear for long, economical periods of use. Typical shapes in which Carboloy can be supplied are illustrated below.

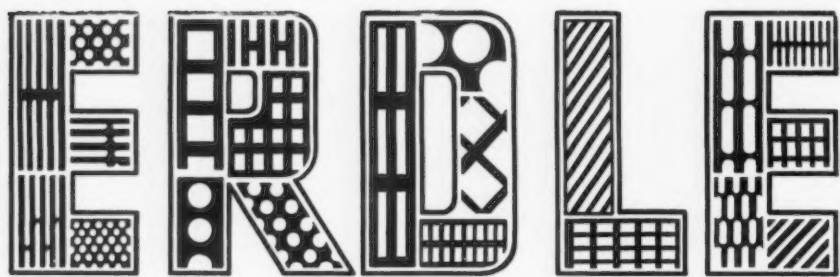


* Carboloy cemented carbide.



CARBOLOY COMPANY INC.
2995 EAST JEFFERSON AVENUE, DETROIT, MICH.
CHICAGO NEWARK PHILADELPHIA CLEVELAND PITTSBURGH
CANADA: CANADIAN GENERAL ELECTRIC CO., LTD., TORONTO





PERFORATED METALS
IN
ALUMINUM, TIN, ZINC, BRASS,
COPPER, STEEL & OTHER METALS

If you have a problem that requires perforated metal—think of the thousands of perforated metal problems which hundreds of Erdle customers have run up against during the past 60 years.

Erdle helped solve those perforated metal problems. Our experimental department developed new ideas. Our plant facilities and our experience both grew up around the central idea of an intelligent service to customers.

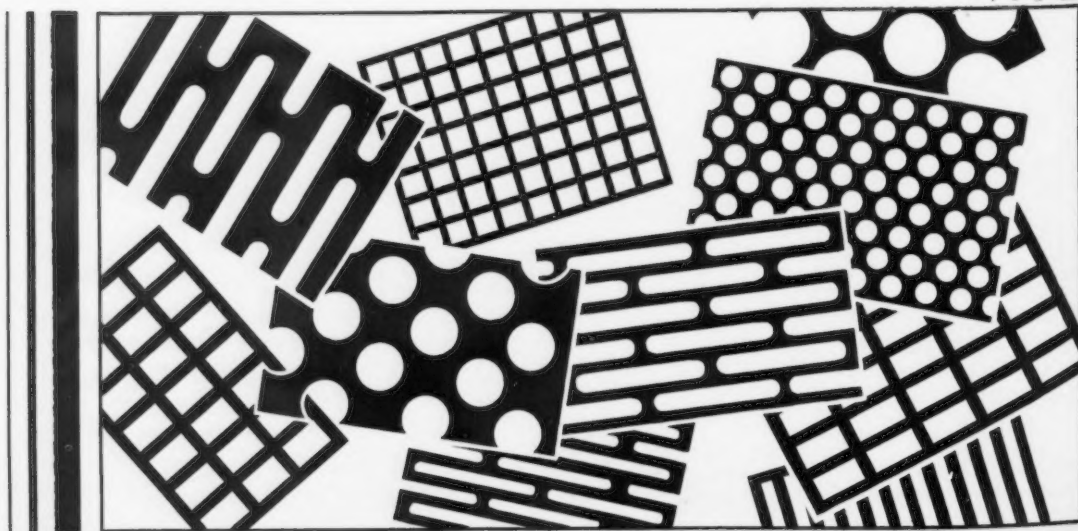
Today we carry large stocks of blank sheets and can give you almost anything in perforated metal for any purpose, and in quick time.

Would you like a sample plate?

ERDLE PERFORATING CO.

ROCHESTER

NEW YORK



Statistical Record of Iron and Steel

Monthly Average Prices Computed from the Weekly Market Quotations of
THE IRON AGE

Composite Pig Iron Price

Average of THE IRON AGE quotations on basic pig iron at Valley furnace and foundry iron at Chicago, Birmingham, Buffalo, Valley and Philadelphia. Quoted in gross tons

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan.	\$33.21	\$31.36	\$39.39	\$31.18	\$18.48	\$26.78	\$22.15	\$22.44	\$21.79	\$19.44	\$17.63	\$18.43	\$18.19	\$15.90	\$14.68	\$13.56	\$16.90
Feb.	33.21	31.36	42.35	28.45	18.14	27.20	22.84	22.50	21.77	19.07	17.73	18.38	18.02	15.80	14.51	13.56	16.90
March . . .	33.21	30.10	42.24	25.18	18.35	30.11	22.81	21.99	21.65	19.03	17.73	18.36	17.75	15.71	14.45	13.56	16.90
April . . .	32.71	27.11	43.01	23.73	20.00	30.83	22.31	20.95	20.96	19.21	17.67	18.52	17.73	15.79	14.35	13.76	17.07
May	32.71	26.91	43.64	22.78	23.35	29.74	21.40	19.85	20.69	19.09	17.45	18.70	17.60	15.76	14.12	14.48	17.90
June	32.71	26.46	44.09	21.73	23.95	28.23	20.27	19.22	20.00	18.92	17.23	18.65	17.48	15.62	14.01	15.01	17.90
July	32.73	26.37	45.44	20.22	23.86	25.96	19.31	18.96	19.51	18.56	17.10	18.48	17.16	15.56	13.76	15.50	17.90
Aug.	32.73	26.83	47.38	18.97	26.69	25.19	19.40	19.01	19.46	18.17	17.11	18.39	16.90	15.51	13.69	16.09	17.90
Sept. . . .	32.73	27.11	47.83	19.89	31.78	25.02	19.46	19.39	19.46	18.03	17.54	18.27	16.70	15.44	13.64	16.71	17.90
Oct.	34.31	27.52	45.05	19.97	30.57	23.30	19.46	19.92	19.69	17.96	17.94	18.33	16.31	15.21	13.63	16.61	17.90
Nov.	34.36	30.34	38.65	19.79	27.82	21.40	19.79	21.16	20.13	17.59	18.46	18.36	16.21	14.97	13.59	16.61	17.90
Dec.	34.26	36.13	34.51	19.11	25.70	21.88	21.60	21.54	19.94	17.55	18.51	18.24	15.95	14.86	13.56	16.90	17.90
Aver. . . .	33.24	28.97	42.76	22.58	24.06	26.30	20.90	20.58	20.42	18.55	17.68	18.43	17.17	15.51	14.00	15.20	17.58

Basic Pig Iron at Mahoning or Shenango Valley Furnace, Gross Ton

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan.	\$33.00	\$30.00	\$37.40	\$30.00	\$18.15	\$25.80	\$21.25	\$22.00	\$20.00	\$18.00	\$17.00	\$17.50	\$18.50	\$17.00	\$15.00	\$13.50	\$17.00
Feb.	33.00	30.00	42.25	27.50	17.75	26.25	22.00	22.00	20.00	18.00	17.00	17.50	18.50	16.75	14.62	13.50	17.00
March . . .	33.00	28.94	41.50	24.20	17.94	30.13	21.94	21.30	20.00	18.40	17.00	17.50	18.50	16.50	14.50	13.50	17.00
April . . .	32.00	25.75	42.40	22.88	20.00	31.05	21.55	20.13	18.63	19.00	16.88	17.90	18.50	16.50	14.50	13.50	17.25
May	32.00	25.75	43.25	22.00	24.60	29.00	20.50	18.81	18.38	18.20	16.30	18.38	18.50	16.25	14.20	14.20	18.00
June	32.00	25.75	44.00	20.75	25.00	27.38	19.63	18.05	18.00	17.88	15.45	18.50	18.50	15.50	14.00	15.00	18.00
July	32.00	25.75	45.85	19.38	24.25	25.10	19.00	18.00	17.63	17.50	16.00	18.50	18.10	15.50	13.50	15.50	18.00
Aug.	32.00	25.75	48.10	18.20	26.60	24.75	19.00	18.00	17.50	17.30	16.00	18.50	18.00	15.50	13.50	16.20	18.00
Sept. . . .	32.00	25.75	48.50	19.13	32.63	24.88	19.00	18.30	17.50	17.06	16.19	18.50	17.60	15.50	13.50	17.00	18.00
Oct.	33.00	25.75	43.75	19.19	30.90	23.50	19.00	18.63	18.00	17.00	17.10	18.50	17.00	15.25	13.50	17.00	18.00
Nov.	33.00	28.31	36.50	19.00	27.75	20.88	19.13	19.88	18.50	17.00	17.50	18.50	17.00	15.00	13.50	17.00	18.00
Dec.	33.00	34.25	33.00	18.63	24.81	21.00	20.90	20.00	18.50	17.00	17.50	18.50	17.00	15.00	13.50	17.00	18.00
Aver. . . .	32.50	27.65	42.21	21.74	24.20	25.81	20.24	19.59	18.55	17.70	16.66	18.19	17.98	15.85	13.98	15.24	17.85

Bessemer Pig Iron at Mahoning or Shenango Valley Furnace, Gross Ton

	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan.	\$38.60	\$32.00	\$19.60	\$27.50	\$23.00	\$22.88	\$21.00	\$19.50	\$17.50	\$18.25	\$19.00	\$17.50	\$16.00	\$15.00	\$18.00
Feb.	41.50	29.00	19.50	28.06	23.50	22.75	21.00	19.00	17.50	18.25	19.00	17.25	15.62	15.00	18.00
March . . .	42.00	26.20	19.50	30.25	23.38	22.30	21.00	19.40	17.50	18.38	19.00	17.00	15.50	15.00	18.00
April . . .	42.20	25.00	20.63	31.00	22.80	21.13	19.63	19.50	17.50	18.50	19.00	17.00	15.50	15.00	18.25
May	42.63	24.20	24.40	30.10	22.13	20.00	19.38	19.20	17.30	19.00	19.00	17.00	15.20	15.20	19.00
June	43.00	22.75	25.00	28.50	21.13	19.00	19.00	18.88	17.00	19.00	19.00	17.00	15.00	16.00	19.00
July	45.60	20.88	25.00	26.70	20.20	19.00	18.63	18.50	17.00	19.00	18.60	17.00	15.00	16.50	19.00
Aug.	47.39	20.00	28.20	26.50	20.00	19.00	18.00	18.40	17.00	19.00	18.50	17.00	15.00	17.20	19.00
Sept. . . .	48.50	20.00	33.50	26.50	20.00	19.30	18.25	18.00	17.19	19.00	18.30	17.00	15.00	18.00	19.00
Oct.	47.25	20.00	33.40	25.20	20.00	19.63	19.13	18.00	17.55	19.00	17.75	16.88	15.00	18.00	19.00
Nov.	40.25	20.00	31.75	23.25	20.38	20.88	19.90	18.00	18.19	19.00	17.50	16.50	15.00	18.00	19.00
Dec.	35.00	20.00	28.13	22.88	21.00	21.00	19.88	17.56	18.25	19.00	17.50	16.20	15.00	18.00	19.00
Aver. . . .	42.82	23.34	25.63	27.20	21.53	20.57	19.57	18.66	17.46	18.78	18.51	16.94	15.23	16.41	18.69

No. 2 Foundry Iron at Mahoning or Shenango Valley Furnace, Gross Ton

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan.	\$33.00	\$31.00	\$39.40	\$31.88	\$19.30	\$27.00	\$22.50	\$22.38	\$20.50	\$18.50	\$17.25	\$17.50	\$18.50	\$17.00	\$15.50	\$14.50	\$17.50
Feb.	33.00	31.00	41.50	28.00	18.88	27.50	23.00	22.00	20.50	18.50	17.25	17.50	18.50	16.75	15.12	14.50	17.50
March . . .	33.00	29.94	41.25	25.90	19.00	30.50	23.00	21.10	20.50	18.50	17.25	17.75	18.50	16.50	15.00	14.50	17.50
April . . .	33.00	26.75	42.80	24.75	20.75	31.00	21.80	20.13	19.00	18.50	17.25	18.00	18.50	17.00	15.00	14.50	17.75
May	33.00	26.75	44.25	23.50	23.80	30.20	20.75	19.13	18.88	18.50	17.20	18.50	18.50	17.00	14.70	14.70	18.50
June	33.00	26.75	45.00	22.10	24.00	27.63	19.63	18.30	17.96	18.13	16.75	18.50	18.50	17.00	14.50	15.50	18.50
July	33.00	26.75	45.00	20.13	24.25	25.50	19.00	18.50	17.69	18.00	16.65	18.50	18.10	17.00	14.50	16.00	18.50
Aug.	33.00	26.75	47.00	19.63	32.60	24.88	19.13	18.50	17.50	17.60	16.50	18.50	18.00	17.00	14.50	16.70	18.50
Sept. . . .	33.00	26.75	49.40	21.00	34.88	24.75	19.80	18.80	17.63	17.50	16.88	18.50	17.80	17.00	14.50	17.50	18.50
Oct.	34.00	26.75	46.50	21.00	31.80	23.60	19.50	19.13	18.50	17.50	17.10	18.50	17.13	16.63	14.50	17.50	18.50
Nov.	34.00	31.50	40.25	20.75	27.88	21.88	19.50	20.39	19.00	17.45	17.63	18.50	17.00	16.00	14.50	17.50	18.50
Dec.	34.00	36.75	36.20	20.00	25.63	22.00	21.20	20.50	18.80	17.25	17.70	18.50	17.00	15.70	14.50	17.50	18.50
Aver. . . .	33.25	28.95	43.21	23.22	25.23	26.37	20.73	19.90	18.87	18.00	17.12	18.23	18.00	16.72	14.73	15.91	18.19

Malleable Pig Iron at Mahoning or Shenango Valley Furnace, Gross Ton

	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan.	\$39.25	\$32.00	\$19.50	\$27.00	\$22.39	\$22.39	\$20.50	\$18.50	\$17.30	\$18.00	\$19.00	\$17.50	\$16.00	\$14.50	\$17.50
Feb.	42.75	28.75	19.00	27.63	23.00	22.00	20.50	18.50	17.25	18.00	19.00	17.25	15.62	14.50	17.50
March	42.40	25.80	19.00	30.50	22.50	21.50	20.50	18.50	17.25	18.25	19.00	17.00	15.50	14.50	17.50
April	43.25	25.00	19.50	31.00	22.10	20.63	19.00	18.50	17.25	18.50	19.00	17.00	15.50	14.50	17.75
May	43.88	24.10	24.20	30.20	21.00	19.25	18.88	18.50	17.25	19.00	19.00	17.00	15.20	14.70	18.50
June	44.20	22.75	24.50	28.13	19.88	18.50	18.05	18.13	17.00	19.00	19.00	17.00	15.00	15.50	18.50
July	45.00	20.88	25.13	25.40	19.00	18.50	17.75	18.00	17.00	19.00	18.60	17.00	14.50	16.00	18.50
Aug.	48.40	20.00	29.50	24.50	19.13	18.50	17.50	17.60	17.00	19.00	18.50	17.00	14.50	16.70	18.50
Sept.	50.00	20.13	33.50	24.50	19.80	18.80	17.63	17.50	17.19	19.00	18.30	17.00	14.50	17.50	18.50
Oct.	49.00	20.50	32.70	23.30	19.50	19.13	18.50	17.50	17.55	19.00	17.75	16.88	14.50	17.50	18.50
Nov.	39.30	20.20	29.00	20.88	19.75	20.38	19.00	17.50	18.19	19.00	17.50	16.50	14.50	17.50	18.50
Dec.	35.00	20.00	26.25	20.00	21.20	20.50	18.75	17.50	18.15	19.00	17.50	16.20	14.50	17.50	18.50
Aver.	45.53	23.31	25.15	26.09	20.77	20.01	18.88	18.02	17.37	18.73	18.51	16.94	14.98	15.91	18.11

No. 2 Foundry Pig Iron at Chicago Furnace, Gross Ton

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan. ...	\$33.00	\$31.00	\$40.00	\$31.50	\$18.90	\$28.90	\$23.70	\$24.00	\$23.00	\$20.88	\$18.50	\$20.00	\$20.00	\$17.50	\$16.50	\$15.50	\$17.50
Feb. ...	33.00	31.00	42.25	29.00	19.00	29.75	24.50	24.00	23.00	20.25	18.50	20.00	20.00	17.50	16.50	15.50	17.50
March ...	33.00	29.94	43.00	25.60	20.00	31.25	24.38	23.80	23.00	20.00	18.50	20.00	19.50	17.50	16.50	15.50	17.50
April ...	33.00	26.75	43.00	24.00	20.50	32.00	24.10	22.50	22.00	20.00	18.50	20.00	19.40	17.50	16.00	15.50	17.75
May ...	33.00	26.75	43.00	22.80	22.60	32.00	22.75	21.13	21.63	20.00	18.20	20.00	19.00	17.50	16.00	15.80	18.50
June ...	33.00	26.75	43.40	20.75	23.25	31.25	21.25	20.30	21.10	20.00	18.00	20.00	18.39	17.50	16.00	16.00	18.50
July ...	33.00	26.75	45.25	19.00	24.25	27.90	19.60	20.50	21.00	20.00	17.60	20.00	17.90	17.50	15.50	16.78	18.50
Aug. ...	33.00	26.75	46.00	19.55	28.60	27.00	20.38	20.50	21.00	19.50	17.63	20.00	17.50	17.50	15.50	17.10	18.50
Sept. ...	33.00	26.75	46.00	21.75	32.00	26.75	20.50	21.00	21.00	19.50	18.25	20.00	17.50	17.50	15.50	17.50	18.50
Oct. ...	34.00	27.75	44.50	21.00	31.40	25.00	20.50	21.63	21.00	19.00	18.80	20.00	17.50	17.00	15.50	17.50	18.50
Nov. ...	34.00	31.00	39.40	20.60	29.75	23.13	21.00	22.75	21.00	18.50	20.00	20.00	17.50	17.00	15.50	17.50	18.50
Dec. ...	34.00	38.75	34.50	19.63	28.00	23.00	22.50	23.00	21.00	18.50	20.00	20.00	17.50	16.70	15.50	17.50	18.50
Aver. ...	33.25	29.16	42.53	22.93	24.85	28.16	22.10	22.09	21.64	19.68	18.54	20.00	18.47	17.35	15.87	16.47	18.19

Malleable Pig Iron at Chicago Furnace, Gross Ton

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan. ...	\$33.50	\$31.50	\$40.50	\$32.00	\$18.90	\$28.90	\$23.88	\$24.00	\$23.00	\$20.88	\$18.50	\$20.00	\$20.00	\$17.50	\$16.50	\$15.50	\$17.50
Feb. ...	33.50	31.50	42.75	29.38	19.15	29.75	24.50	24.00	23.00	20.25	18.50	20.00	20.00	17.50	16.50	15.50	17.50
March ...	33.50	30.44	43.50	25.80	20.00	31.25	24.38	24.00	23.00	20.00	18.50	20.00	19.50	17.50	16.50	15.50	17.50
April ...	33.50	27.25	43.50	24.00	20.50	32.00	24.10	22.63	22.00	20.00	18.50	20.00	19.40	17.50	16.00	15.50	17.75
May ...	33.50	27.25	43.50	23.00	22.60	32.00	22.75	21.25	21.42	20.00	18.22	20.00	19.00	17.50	16.00	15.80	18.50
June ...	33.50	27.25	43.50	21.50	23.25	31.25	21.25	20.60	21.10	20.00	18.00	20.00	18.50	17.50	16.00	16.00	18.50
July ...	33.50	27.25	45.25	19.00	24.25	27.90	19.60	20.50	21.00	20.00	17.60	20.00	17.90	17.50	15.50	16.78	18.50
Aug. ...	33.50	27.25	46.50	19.60	28.60	27.00	20.38	20.50	21.00	19.50	17.63	20.00	17.50	17.50	15.50	17.10	18.50
Sept. ...	33.50	27.25	46.50	21.75	32.00	26.75	20.50	21.00	21.00	19.50	18.25	20.00	17.50	17.50	15.50	17.50	18.50
Oct. ...	34.50	28.25	45.75	21.00	31.40	25.00	20.50	21.63	21.00	19.00	18.80	20.00	17.50	17.10	15.50	17.50	18.50
Nov. ...	34.50	31.50	39.90	20.60	29.75	23.13	20.88	22.75	21.00	18.50	20.00	20.00	17.50	17.00	15.50	17.50	18.50
Dec. ...	34.50	39.50	35.00	19.63	28.00	23.00	22.62	23.00	21.00	18.50	20.00	20.00	17.50	16.70	15.50	17.50	18.50
Aver. ...	33.75	29.68	43.01	23.11	24.87	28.16	22.11	22.15	21.63	19.68	18.54	20.00	18.48	17.36	15.87	16.47	18.19

Lake Superior Charcoal Pig Iron at Chicago, Gross Ton

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan. ...	\$37.50	\$38.85	\$48.75	\$42.50	\$31.10	\$33.15	\$29.15	\$29.04	\$29.04	\$27.04	\$27.04	\$27.04	\$27.04	\$27.04	\$23.17	\$23.17	\$23.54
Feb. ...	37.50	38.85	58.38	39.50	29.38	33.90	29.15	29.04	29.04	27.04	27.04	27.04	27.04	27.04	23.17	23.17	23.54
March ...	37.50	38.85	58.20	38.50	26.00	35.40	29.15	29.04	29.04	27.04	27.04	27.04	25.04	26.24	23.17	23.17	23.54
April ...	37.50	31.75	57.25	38.50	26.50	36.53	29.15	29.04	29.04	27.04	27.04	27.04	27.04	25.04	23.17	23.17	24.79
May ...	37.50	31.75	57.50	37.50	28.40	36.65	29.15	29.04	29.04	27.04	27.04	27.04	27.04	25.04	23.17	23.17	24.04
June ...	37.62	31.75	57.50	37.50	29.75	36.65	29.12	29.04	29.04	27.04	27.04	27.04	27.04	25.04	23.17	23.17	24.04
July ...	38.00	31.75	57.50	36.37	31.65	34.81	29.04	29.04	29.04	27.04	27.04	27.04	27.04	25.04	23.17	23.17	24.04
Aug. ...	38.00	32.25	57.70	33.60	34.05	32.04	29.04	29.04	29.04	27.04	27.04	27.04	27.04	25.04	23.17	23.17	24.04
Sept. ...	38.00	32.75	58.50	33.00	36.15	32.04	29.04	29.04	29.04	27.04	27.04	27.04	27.04	25.04	23.17	23.67	24.04
Oct. ...	38.00	33.44	58.50	31.50	36.15	29.86	29.04	29.04	27.54	27.04	27.04	27.04	27.04	25.04	23.17	23.54	24.04
Nov. ...	38.70	38.50	55.75	31.50	36.15	28.40	29.04	29.04	27.54	27.04	27.04	27.04	27.04	25.04	23.17	23.54	24.04
Dec. ...	38.70	43.00	49.13	31.50	34.65	29.15	29.04	29.04	27.04	27.04	27.04	27.04	27.04	23.04	23.17	23.54	24.04
Aver. ...	37.88	35.29	56.22	35.96	31.66	33.22	29.09	29.04	28.58	27.04	27.04	27.04	26.87	25.31	23.17	23.30	23.98

Southern No. 2 Foundry Pig Iron at Birmingham, Gross Ton

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan. ...	\$33.00	\$31.00	\$38.75	\$22.25	\$16.20	\$23.25	\$21.50	\$20.00	\$22.00	\$18.50	\$16.00	\$16.50	\$14.50	\$13.80	\$11.50	\$11.00	\$13.50
Feb. ...	33.00	31.00	40.00	28.13	15.00	24.38	22.50	20.00	22.00	18.00	16.00	16.50	14.63	12.88	11.00	11.00	13.50
March ...	33.00	29.44	40.00	25.30	15.00	26.40	22.50	20.00	22.00	18.00	16.00	16.00	14.50	12.38	11.00	11.00	13.50
April ...	33.00	26.75	40.50	23.50	15.88	27.00	22.30	20.00	22.00	18.00	16.00	15.40	14.00	12.00	11.00	11.25	13.50
May ...	33.00	26.75	42.00	22.20	17.60	26.85	21.50	20.00	22.00	18.00	15.70	15.00	14.00	12.00	11.00	12.00	14.30
June ...	33.00	25.25	42.00	21.88	18.38	25.75	20.00	19.60	21.20	18.00	15.88	15.00	14.00	12.00	11.00	12.00	14.50
July ...	33.00	25.15	42.00	20.25	18.25	25.00	18.00	18.00	21.00	17.44	15.50	14.63	14.00	12.00	11.00	12.50	14.50
Aug. ...	33.00	27.38	42.00	19.00	20.10	23.70	17.50	18.00	21.00	17.25	15.69	14.50	14.00	12.00	11.00	13.10	14.50
Sept. ...	33.00	27.95	42.00	19.00	26.00	22.75	17.50	18.50	20.75	17.25	16.25	14.50	14.00	12.00	11.00	13.50	14.50
Oct. ...	34.00	28.00	42.00	19.00	26.80	20.63	17.50	19.38	20.00	17.25	16.25	14.50	14.00	12.00	11.00	13.50	14.50
Nov. ...	34.00	30.75	38.00	18.40	23.50	19.60	17.75	21.00	20.00	16.00	16.39	14.50	14.00	12.00	11.00	13.50	14.50
Dec. ...	33.40	35.20	38.00	17.33	22.88	21.00	19.80	22.00	20.00	16.00	16.50	14.50	14.00	12.00	11.00	13.50	14.50
Aver. ...	33.20	28.72	40.60	22.19	19.63	23.86	19.86	19.71	21.16	17.47	16.01	15.13	14.14	12.27	11.04	12.32	14.15

Southern No. 2 Foundry Pig Iron at Cincinnati, Gross Ton

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan. ...	\$35.90	\$34.60	\$41.80	\$36.75	\$20.70	\$27.45	\$25.55	\$24.05	\$25.69	\$22.19	\$19.69	\$20.19	\$17.69	\$14.19	\$14.07	\$13.82	\$18.13
Feb. ...	35.90	34.60	43.60	32.63	20.00	28.68	26.55	24.05	25.69	21.69	19.69	20.19	17.19	14.19	13.82	13.82	18.13
March ...	35.90	33.54	43.60	29.80	19.50	30.80	26.55	24.05	25.69	21.69	19.69	19.69	16.69	14.19	13.82	13.82	18.13
April ...	35.90	30.65	44.00	28.00	20.38	31.05	26.35	24.05	25.69	21.69	19.69	19.09	16.69	14.19	13.82	14.32	18.13
May ...	35.90	29.85	45.60	26.70	22.10	30.75	25.55	24.05	25.69	21.69	19.39	18.69	16.69	14.69	13.82	15.96	19.13
June ...	36.08	28.39	45.60	26.38	23.00	29.30	24.05	23.25	24.59	21.69	19.56	18.69	16.69	14.69	13.82	16.51	19.13
July ...	36.60	28.35	45.60	24.75	22.30	28.85	22.05	22.18	24.19	21.13	19.19	17.99	16.39	14.69	13.82	17.01	19.13
Aug. ...	36.60	30.40	45.78	23.50	24.35	27.68	21.55	22.55	24.19	20.94	19.39	17.57	15.82	14.69	13.82	17.83	19.13
Sept. ...	36.60	31.25	46.50	23.50	29.55	26.55	21.55	22.85	24.07	20.94	19.94	17.19	15.49	14.69	13.82	18.23	19.13
Oct. ...	37.60	31.60	46.50	23.50	30.85	24.68	21.55	23.43	23.69	20.94	19.94	17.30	15.19	14.69	13.82	18.13	19.13
Nov. ...	37.60	34.35	42.50	22.90	27.55	23.65	21.80	24.87	23.69	19.69	20.07	17.69	14.94	14.69	13.82	18.13	19.13
Dec. ...	37.60	38.60	42.50	21.75	26.93	25.05	23.85	25.49	23.69	19.69	20.19	17.69	14.39	14.69	13.82	18.13	19.13
Aver. ...	36.52	32.16	44.47	26.68	23.93	27.87	23.91	23.74	24.71	21.16	19.70	18.51	16.16	14.52	13.84	16.31	19.90

Eastern Pennsylvania No. 2X Foundry Pig Iron at Philadelphia, Gross Ton

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan. ...	\$34.25	\$36.15	\$44.10	\$33.34	\$21.34	\$29.76	\$24.11	\$25.01	\$24.26	\$22.76	\$20.56	\$21.76	\$21.26	\$18.26	\$16.14	\$13.84	\$19.51
Feb. ...	34.25	36.15	45.10	31.09	21.09	30.01	24.04	25.01	24.14	22.26	21.14	21.76	21.26	18.26	16.14	13.34	19.51
March ...	34.25	34.39	45.53	27.59	21.26	32.30	24.16	24.21	23.36	22.26	21.26	21.89	20.76	18.26	16.12	13.84	19.51
April ...	34.25	31.90	46.85	26.26	23.62	32.95	23.06	22.82	23.26	22.26	21.26	22.26	20.76	18.26	16.09	14.59	19.76
May ...	34.25	30.70	47.10	25.71	26.09	32.76	22.67	21.51	22.89	22.26	21.26	22.26	20.39	17.76	15.34	15.99	20.51
June ...	34.29	29.50	47.15	25.50	27.06	30.76	21.85	21.26	22.66	22.14	21.26	22.26	20.26	17.71	15.34	16.84	20.51
July ...	34.40	29.08	48.15	23.55	27.92	27.68	21.26	21.26	22.26	21.51	20.86	22.16	19.96	17.51	14.84	17.22	20.51
Aug. ...	34.40	29.60	51.96	20.64	32.26	25.89	21.51	21.57	22.26	21.26	20.76	21.76	19.76	17.32	14.54	17.79	20.51
Sept. ...	34.40	30.70	53.51	21.22	34.83	26.26	21.76	21.96	22.26	20.76	21.01	21.76	19.56	16.86	14.34	18.59	20.51
Oct. ...	38.85	32.10	52.53	22.23	32.54	24.04	21.76	22.64	22.26	20.51	21.26	21.76	19.26	16.64	14.28	18.51	20.51
Nov. ...	39.15	35.35	44.99	22.74	30.39	23.01	22.64	23.64	23.56	20.26	21.64	21.76	19.01	16.07	14.09	18.51	20.51
Dec. ...	39.15	40.10	35.54	21.82	28.86	24.26	24.56	24.26	23.39	20.26	21.76	21.46	18.26	16.01	13.84	19.51	20.51
Aver. ...	35.49	32.98	46.88	25.14	27.27	28.31	22.78	22.93	23.05	21.55	21.17	21.90	20.04	17.41	15.09	16.55	20.20

Basic Pig Iron, Delivered Eastern Pennsylvania, Gross Ton

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan. ...	\$33.75	\$33.90	\$39.19	\$23.51	\$20.18	\$27.80	\$23.00	\$24.25	\$23.00	\$21.50	\$19.50	\$19.75	\$19.50	\$17.25	\$16.25	\$13.50	\$18.76
Feb. ...	33.75	33.90	41.90	30.65	19.84	28.19	22.69	23.88	23.00	21.19	19.50	19.88	19.44	17.25	16.25	13.50	18.76
March ...	33.75	32.84	44.24	26.15	22.61	29.56	21.81	23.55	22.10	20.85	19.50	20.25	19.06	17.25	16.00	13.50	18.76
April ...	32.75	29.65	44.80	25.00	21.00	30.81	21.50	22.31	21.75	20.75	19.50	20.25	18.90	17.13	16.00	14.09	18.91
May ...	32.75	29.65	44.80	25.00	24.00	30.60	21.00	21.13	21.75	20.75	19.10	20.25	18.75	17.00	16.00	15.29	19.76
June ...	32.79	26.54	44.66	24.63	25.00	28.14	21.00	21.50	21.45	20.75	19.00	20.25	18.75	17.00	16.00	16.09	19.76
July ...	32.90	26.12	43.70	22.38	25.75	26.60	20.20	21.50	21.00	20.75	18.95	20.20	18.45	16.75	15.50	16.59	19.76
Aug. ...	32.90	26.60	47.21	19.70	27.23	25.00	20.00	20.50	20.95	20.15	18.75	19.75	18.25	16.75	14.20	17.24	19.76
Sept. ...	32.90	26.60	51.26	19.19	30.83	25.00	20.00	20.70	20.75	20.00	18.88	19.75	18.15	16.75	13.50	17.84	19.76
Oct. ...	36.60	28.00	49.60	20.50	29.30	24.20	20.00	21.25	20.69	20.00	19.45	19.75	17.75	16.75	13.50	17.76	19.76
Nov. ...	36.90	30.38	41.94	20.70	27.83	22.88	21.13	22.39	22.60	19.60	19.75	19.75	17.75	16.39	13.50	17.76	19.76
Dec. ...	36.90	35.00	44.15	20.63	27.31	23.13	23.41	23.00	22.00	19.25	20.05	19.55	17.75	16.25	13.50	18.76	19.76
Aver. ...	34.05	29.93	44.79	24.00	25.08	26.83	21.31	22.16	21.75	20.46	19.33	19.95	18.54	16.87	15.02	15.99	19.45

No. 2 Foundry Pig Iron at Cleveland Furnace, Gross Ton

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan. ...	\$33.30	\$31.40	\$40.00	\$33.40	\$20.06	\$27.37	\$23.20	\$23.37	\$21.82	\$19.00	\$18.00	\$19.00	\$19.00	\$17.50	\$16.00	\$15.00	\$17.50
Feb. ...	33.30	31.40	41.90	30.22	20.06	28.50	24.00	23.49	21.88	18.63	18.00	19.00	19.00	17.50	16.00	15.00	17.50
March ...	33.30	30.58	43.15	27.80	21.55	31.65	24.00	23.97	21.31	19.40	18.00	19.00	19.00	17.20	15.70	15.00	17.50
April ...	33.30	27.15	43.40	26.62	20.81	32.02	23.75	22.32	20.35	19.37	18.00	19.00	18.88	17.00	15.50	15.00	18.00
May ...	33.30	27.15	44.53	25.50	23.75	31.71	22.75	20.37	19.50	19.00	18.00	19.00	18.50	17.00	15.50	15.30	18.50
June ...	33.32	27.15	44.90	24.00	24.06	29.96	21.00	19.62	19.19	18.70	17.88	19.00	18.50	17.00	15.50	15.50	18.50
July ...	33.40	27.15	45.20	21.31	24.75	26.94	19.75	19.50	19.00	18.50	17.50	19.00	18.00	17.00	15.50	16.00	18.50
Aug. ...	33.40	27.40	48.06	20.50	31.31	25.90	20.06	19.50	19.00	18.50	17.50	19.00	18.00	17.00	15.50	16.70	18.50
Sept. ...	33.40	27.65	49.86	20.75	35.94	25.37	20.31	19.50	19.00	18.50	17.88	19.00	17.60	17.00	15.00	17.50	18.50
Oct. ...	34.40	28.15	47.88	20.75	33.59	24.75	20.50	20.05	19.37	18.38	18.13	19.00	17.50	17.00	15.00	17.50	18.50
Nov. ...	34.40	31.90	43.46	20.56	29.97	22.85	20.81	21.82	20.10	18.00	19.00	19.00	17.50	17.00	15.00	17.50	18.50
Dec. ...	34.40	36.90	36.32	19.95	26.85	22.56	21.88	21.76	19.88	18.00	19.00	19.00	17.50	16.60	15.00	17.50	18.50
Aver. ...	33.60	29.67	44.06	24.28	26.05	27.47	21.84	21.19	20.03	18.67	18.16	19.00	18.25	17.07	15.43	16.13	18.21

No. 2 Foundry Pig Iron at Buffalo Furnace, Gross Ton

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan. ...	\$33.00	\$31.00	\$40.90	\$32.38	\$19.44	\$26.94	\$22.25	\$23.00	\$21.00	\$18.50	\$17.00	\$18.00	\$18.75	\$17.50	\$16.00	\$16.00	\$17.50
Feb. ...	33.00	31.00	42.00	30.50	18.87	27.56	22.25	22.75	21.00	17.39	17.00	18.39	18.50	17.50	16.00	16.00	17.50
March ...	33.00	29.94	44.75	29.00	18.30	29.05	21.81	22.12	21.00	17.05	17.00	18.50	18.50	17.50	16.00	16.00	17.50
April ...	33.00	26.75	45.00	26.15	20.81	29.56	21.37	20.65	21.00	17.50	17.00	18.50	18.50	17.50	16.00	16.00	17.50
May ...	33.00	26.75	45.00	25.62	22.62	29.40	20.25	19.00	20.75	17.50	17.00	18.50	18.50	17.13	16.00	16.00	17.50
June ...	33.00	26.75	44.75	23.42	23.05	29.06	19.37	19.00	19.60	17.39	17.00	18.75	18.50	17.00	16.00	16.00	18.50
July ...	33.00	26.63	45.00	20.87	24.50	26.00	19.00	18.85	19.00	16.94	17.00	19.50	18.50	17.00	16.00	16.50	18.50
Aug. ...	33.00	27.77	47.75	19.50	30.70	24.95	19.19	18.72	19.00	16.20	17.00	19.50	18.50	17.00	16.00	17.10	18.50
Sept. ...	33.00	28.25	50.10	20.00	33.94	24.87	19.37	18.75	19.00	16.25	17.00	19.50	18.50	17.00	16.00	17.50	18.50
Oct. ...	34.00	28.70	47.44	20.37	31.12	23.06	19.05	19.40	19.00	16.88	17.10	19.50	17.75	17.00	16.00	17.50	18.50
Nov. ...	34.00	34.30	42.56	19.12	27.80	20.87	20.50	21.19	19.00	17.00	17.88	19.50	17.50	17.00	16.00	17.50	18.50
Dec. ...	34.00	38.25	36.60	19.30	25.50	21.56	22.62	21.50	19.00	17.00	18.00	19.50	17.50	16.80	16.00	17.50	18.50
Aver. ...	33.25	29.67	44.32	23.85	24.72	26.07	20.59	20.41	19.86	17.13	17.17	18.97	18.29	17.16	16.00	16.63	18.17

No. 2 Foundry Pig Iron at St. Louis and at Granite City,* Ill., Furnace, Gross Ton

	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan. ...	\$31.61	\$25.68	\$25.06	\$24.56	\$22.31	\$20.56	\$20.75	\$20.50	\$18.25	\$18.33	\$18.33	\$17.50
Feb. ...	31.81	26.56	26.06	24.56	22.06	20.56	20.75	20.50	18.25	18.33	18.33	17.50
March ...	33.43	26.56	26.06	24.56	21.86	20.56	20.75	20.44	18.25	18.33	18.33	17.50
April ...	34.31	26.56	24.37	24.00	21.56	20.56	20.75	20.25	18.25	18.33	17.34	17.75
May ...	34.31	24.31	22.50	23.56	21.56	19.81	20.75	19.75	18.25	18.33	16.55	18.50
June ...	33.56	23.68	21.56	23.16	21.31	19.81	20.75	19.75	18.25	18.33	16.85	18.50
July ...	30.15	22.01	21.56	23.06	21.06	19.76	20.75	19.10	18.25	18.33	17.35	18.50
Aug. ...	29.06	22.12	21.81	23.06	20.56	19.68	20.69	19.00	18.25	18.33	17.85	18.50
Sept. ...	29.31	22.46	22.96	23.06	20.56	20.31	20.50	18.70	18.25	18.33	17.50	18.50
Oct. ...	27.21	22.56	23.62	22.56	20.56	20.56	20.50	18.25	18.25	18.33	17.50	18.50
Nov. ...	25.93	22.56	24.12	22.36	20.56	20.87	20.50	18.25	18.25	18.33	17.50	18.50
Dec. ...	26.61	24.26	24.56	22.56	20.56	20.81	20.50	18.25	18.25	18.33	17.50	18.50
Aver. ...	30.61	24.11	23.69	23.12	21.21	20.33	20.66	19.39	18.25	18.33	17.58	18.19

Ferroalloy Quotations

Ferromanganese (80 Per Cent), Gross Ton, at Seaboard

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan.	\$250.00	\$255.00	\$146.00	\$112.50	\$58.35	\$105.00	\$108.70	\$112.50	\$115.00	\$100.00	\$100.00	\$105.00	\$100.00	\$80.00	\$75.00	\$68.00	\$85.00
Feb.	250.00	215.00	172.50	100.00	60.42	107.50	107.50	115.00	115.00	100.00	100.00	105.00	95.50	80.00	75.00	68.00	85.00
March	250.00	175.00	216.25	96.00	62.50	113.75	107.50	115.00	97.60	100.00	100.00	105.00	94.00	80.00	75.00	68.00	85.00
April	290.00	150.00	240.00	90.00	64.37	120.00	107.50	115.00	88.00	100.00	100.00	105.00	94.00	80.00	75.00	68.00	85.00
May	290.00	138.40	250.00	85.00	66.87	128.00	107.50	115.00	88.00	94.00	103.00	105.00	94.00	80.00	75.00	68.00	85.00
June	290.00	121.00	225.00	80.00	67.50	128.75	107.50	115.00	88.00	90.00	105.00	105.00	94.00	80.00	68.00	68.00	85.00
July	290.00	111.00	225.00	70.60	67.50	*119.50	106.50	115.00	88.00	90.00	105.00	105.00	94.00	80.00	68.00	82.00	85.00
Aug.	290.00	101.25	198.75	70.00	67.50	117.50	95.75	115.00	88.00	90.00	105.00	105.00	94.00	80.00	68.00	82.00	85.00
Sept.	285.00	98.75	170.00	65.80	75.63	*111.25	90.00	115.00	88.00	90.00	105.00	105.00	94.00	80.00	68.00	82.00	85.00
Oct.	285.00	105.00	170.00	63.00	100.00	*110.00	90.00	115.00	88.00	90.00	105.00	105.00	94.00	80.00	68.00	82.00	85.00
Nov.	285.00	112.50	170.00	61.50	100.00	*108.75	98.75	115.00	96.60	90.00	105.00	105.00	94.00	80.00	68.00	82.00	85.00
Dec.	275.00	122.50	135.00	60.00	100.00	*108.25	107.00	115.00	100.00	100.00	105.00	105.00	82.80	73.60	68.00	82.00	85.00
Aver.	277.50	142.12	193.21	79.53	74.22	114.85	102.85	114.79	95.02	94.50	103.17	105.00	93.70	79.47	70.92	75.00	85.00

*Price at furnace, where lower than price at seaboard.

Spiegeleisen (19 to 21 Per Cent), Gross Ton, at Furnace

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan.	\$60.00	\$66.00	\$51.40	\$45.00	\$26.00	\$34.40	\$38.00	\$33.00	\$32.00	\$37.00	\$30.80	\$31.00	\$31.00	\$28.00	\$26.00	\$24.00	\$27.00
Feb.	61.25	60.75	58.75	40.00	38.00	35.50	38.00	33.00	32.00	37.00	31.00	31.00	31.00	28.00	26.00	24.00	27.00
March	71.25	47.00	60.00	35.00	29.40	40.00	38.00	33.00	32.00	37.00	31.00	31.00	31.00	28.00	26.00	24.00	26.50
April	80.75	45.00	67.60	34.00	32.25	45.00	36.80	33.00	32.00	37.00	31.00	31.00	31.00	28.00	26.00	24.00	26.00
May	84.00	37.40	75.00	32.00	35.00	52.50	36.00	33.00	32.00	36.25	31.00	31.00	31.00	28.00	26.00	24.00	26.00
June	89.00	31.25	75.00	32.00	36.00	48.50	35.00	32.80	32.00	35.50	31.00	31.00	31.00	28.00	25.75	24.00	26.00
July	89.00	35.00	75.00	27.00	36.00	44.00	34.20	32.00	32.00	33.50	31.00	31.00	31.00	28.00	25.00	27.00	26.00
Aug.	89.00	35.00	80.00	26.00	37.80	46.75	32.50	32.00	32.00	33.00	32.50	31.00	31.00	28.00	25.00	27.00	26.00
Sept.	83.75	35.00	82.00	26.00	38.25	43.75	31.40	31.80	32.00	33.00	33.00	31.00	31.00	28.00	25.00	27.00	26.00
Oct.	82.00	35.00	81.88	26.00	38.00	43.75	30.75	31.25	32.00	30.75	33.00	31.00	31.00	28.00	25.00	27.00	26.00
Nov.	80.25	37.00	75.62	26.00	37.50	41.25	30.25	32.00	37.40	30.00	30.00	31.00	30.50	28.00	24.40	27.00	26.00
Dec.	74.38	40.00	59.10	26.00	37.50	39.00	32.00	32.00	36.50	30.00	31.00	31.00	28.40	26.20	24.00	27.00	26.00
Aver.	78.72	42.03	70.11	31.25	34.31	42.87	34.41	32.40	32.83	34.17	31.36	31.00	30.74	27.85	25.85	25.50	26.21

50 Per Cent Ferrosilicon, Gross Ton, Delivered East of Mississippi River

	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan.	\$80.00	\$75.00	\$54.00	\$82.50	\$75.00	\$82.50	\$85.00	\$85.00	\$83.50	\$83.50	\$83.50	\$83.50	\$77.50	\$74.50	\$77.50
Feb.	85.00	93.00	55.00	83.75	75.00	82.50	85.00	85.00	83.50	83.50	83.50	83.50	77.50	74.50	77.50
March	85.00	92.40	55.00	90.00	75.00	82.50	85.00	85.00	83.50	83.50	83.50	83.50	77.50	74.50	77.50
April	85.00	86.25	55.00	92.50	75.00	82.50	85.00	85.00	83.50	83.50	83.50	83.50	77.50	74.50	77.50
May	80.00	76.40	55.00	94.50	75.00	82.50	85.00	85.00	83.50	83.50	83.50	83.50	77.50	74.50	77.50
June	80.00	69.75	55.00	90.00	75.00	82.50	85.00	85.00	83.50	83.50	83.50	83.50	77.50	74.50	77.50
July	80.00	66.00	55.00	82.50	71.00	82.50	85.00	85.00	83.50	83.50	83.50	83.50	77.50	74.50	77.50
Aug.	75.00	60.80	55.00	82.50	71.25	82.50	85.00	85.00	83.50	83.50	83.50	83.50	77.50	74.50	77.50
Sept.	75.00	60.00	55.00	82.50	72.00	82.50	85.00	85.00	83.50	83.50	83.50	83.50	77.50	74.50	77.50
Oct.	75.00	58.50	67.00	81.00	71.00	82.50	85.00	85.00	83.50	83.50	83.50	83.50	77.50	74.50	77.50
Nov.	75.00	55.80	75.00	80.63	70.00	82.50	85.00	85.00	83.50	83.50	83.50	83.50	77.50	74.50	77.50
Dec.	75.00	56.00	82.50	76.25	75.00	82.50	85.00	85.00	83.50	83.50	83.50	83.50	77.50	74.50	77.50
Aver.	79.17	70.83	59.88	84.89	73.35	82.50	85.00	84.88	83.50	83.50	83.50	83.50	77.50	74.50	77.50

Connellsville Coke Prices

Prompt Connellsville Furnace Coke, Net Ton at Oven

	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan.	\$1.50	\$2.95	\$9.50	\$6.00	\$5.65	\$6.00	\$5.06	\$2.75	\$8.05	\$3.94	\$3.94	\$7.19	\$3.50	\$2.70	\$2.75	\$2.55	\$2.50	\$2.25	\$1.75	\$3.60
Feb.	1.50	3.38	9.62	6.00	4.44	6.00	4.50	3.04	7.13	4.08	3.63	7.31	3.38	2.68	2.90	2.60	2.50	2.25	1.75	3.50
March	1.50	3.47	9.60	6.00	4.06	6.00	4.35	3.25	7.25	4.08	3.35	3.05	3.35	2.60	2.98	2.60	2.50	2.25	1.75	3.50
April	1.50	2.41	7.38	6.00	3.65	9.60	3.50	4.48	6.31	3.75	3.04	3.00	3.20	2.60	2.78	2.60	2.50	2.25	1.75	3.85
May	1.50	2.30	7.80	6.00	3.69	12.00	3.25	6.00	5.15	3.25	3.00	2.91	2.94	2.60	2.75	2.53	2.45	2.20	1.75	3.85
June	1.56	2.49	11.25	6.00	4.00	15.00	3.00	6.75	4.75	3.19	2.77	2.83	2.93	2.60	2.75	2.50	2.40	2.00	1.81	3.85
July	1.64	2.75	12.75	6.00	4.07	17.20	2.81	10.75	4.55	3.00	2.83	2.84	3.00	2.63	2.75	2.50	2.40	2.00	2.31	3.85
Aug.	1.50	2.80	13.60	6.00	4.31	17.75	2.75	12.80	4.56	3.00	3.06	2.95	3.00	2.75	2.73	2.58	2.40	2.00	2.55	3.85
Sept.	1.61	2.94	11.12	6.00	4.56	16.70	3.15	11.13	4.50	3.00	3.49	3.38	2.85	2.75	2.65	2.60	2.40	2.00	2.50	3.85
Oct.	2.03	4.88	6.00	6.00	4.52	15.12	3.28	9.60	3.85	3.00	6.13	3.63	2.85	2.83	2.65	2.60	1.40	1.81	3.50	3.85
Nov.	2.28	6.90	6.00	6.00	5.87	8.26	3.03	7.19	3.81	3.04	5.75	4.43	2.77	2.75	2.65	2.53	2.40	1.75	3.75	3.85
Dec.	2.64	8.38	6.00	6.00	6.12	6.20	2.75	7.00	4.00	3.68	4.32	3.50	2.75	2.75	2.63	2.50	2.34	1.75	3.75	3.85
Aver.	1.73	3.80	9.22	6.00	4.58	11.32	3.45	7.01	5.33	3.42	3.78	3.92	3.04	2.69	2.75	2.56	2.43	2.04	2.41	3.79

Prompt Connellsville Foundry Coke, Net Ton at Oven

	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan. . .	\$2.00	\$3.50	\$9.75	\$7.00	\$6.25	\$7.00	\$6.38	\$3.75	\$8.70	\$4.75	\$4.88	\$7.75	\$4.50	\$3.75	\$3.75	\$3.50	\$3.50	\$3.50	\$2.50	\$4.25
Feb. . .	2.00	3.50	11.00	7.00	5.00	7.00	5.63	4.00	8.25	4.88	4.31	8.31	4.31	3.75	3.75	3.50	3.50	3.50	2.50	4.25
March . .	2.00	3.75	11.60	7.00	4.94	7.00	5.45	4.25	8.38	4.88	4.15	4.40	4.40	3.75	3.75	3.50	3.50	3.50	2.50	4.25
April . .	2.00	3.56	9.13	7.00	4.30	10.20	4.75	5.06	7.56	4.75	4.00	4.06	4.06	3.75	3.75	3.50	3.50	3.50	2.50	4.60
May . . .	2.00	3.25	8.90	7.00	4.31	13.00	4.50	6.30	6.15	4.69	4.00	4.00	4.00	3.75	3.75	3.50	3.50	3.10	2.50	4.60
June . .	2.00	3.25	11.72	7.00	4.56	15.75	4.45	7.25	5.56	4.38	4.80	4.00	4.00	3.75	3.75	3.50	3.50	3.00	2.56	4.60
July . . .	2.05	3.25	13.25	7.00	5.00	17.80	4.06	11.00	5.35	4.10	3.75	4.00	4.00	3.75	3.75	3.50	3.50	3.00	2.94	4.60
Aug. . .	2.00	3.30	13.20	7.00	5.25	18.88	3.75	13.90	5.38	4.00	3.88	4.00	4.00	3.75	3.75	3.50	3.50	2.90	3.15	4.60
Sept. . .	2.07	3.31	11.75	7.00	5.80	17.70	4.15	12.50	5.50	4.00	4.25	4.38	4.00	3.75	3.75	3.50	3.50	2.75	3.25	4.60
Oct. . . .	2.35	3.88	6.00	7.00	6.25	16.38	4.38	11.70	4.80	4.00	6.31	4.63	4.00	3.75	3.75	3.50	3.50	2.75	4.05	4.60
Nov. . . .	2.88	7.10	7.00	7.00	7.00	9.50	4.19	8.38	4.81	4.06	6.81	5.50	3.85	3.75	3.75	3.50	3.50	2.75	4.25	4.60
Dec. . . .	2.95	8.63	7.00	7.00	7.00	7.00	3.81	7.88	4.81	4.55	5.20	4.50	3.75	3.75	3.50	3.50	3.25	2.69	4.25	4.60
Aver . . .	2.19	4.19	10.03	7.00	5.17	12.27	4.63	8.00	6.27	4.12	4.61	4.96	4.11	3.75	3.75	3.50	3.48	3.08	3.08	4.51

Structural Shapes at Pittsburgh, Cents a Pound

	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan.	1.10	1.90	3.25	3.00	2.80	2.47	2.45	1.50	2.06	2.50	2.10	1.90	1.98	1.81	1.90	1.83	1.64	1.50	1.60	1.70
Feb.	1.10	2.06	3.25	3.00	2.80	2.70	2.26	1.39	2.20	2.50	2.10	1.90	1.90	1.85	1.90	1.80	1.65	1.50	1.60	1.70
March. . . .	1.10	2.40	3.54	3.00	2.71	3.13	2.08	1.39	2.39	2.39	2.10	1.90	1.90	1.85	1.90	1.80	1.65	1.52	1.60	1.70
April	1.20	2.55	3.88	3.00	2.45	3.25	2.10	1.50	2.50	2.29	2.05	1.90	1.88	1.85	1.95	1.80	1.65	1.60	1.60	1.74
May	1.20	2.60	4.00	3.00	2.45	3.10	2.20	1.56	2.50	2.24	2.00	1.90	1.80	1.85	1.95	1.73	1.65	1.60	1.60	1.85
June	1.20	2.53	4.31	3.00	2.45	3.10	2.10	1.63	2.50	2.20	2.00	1.94	1.80	1.85	1.95	1.69	1.65	1.60	1.60	1.85
July	1.25	2.50	4.50	3.00	2.45	3.10	1.93	1.70	2.50	2.09	2.00	2.00	1.80	1.85	1.95	1.65	1.63	1.60	1.60	1.81
Aug.	1.30	2.52	4.30	3.00	2.45	3.10	1.82	1.88	2.50	2.00	1.95	2.00	1.80	1.90	1.95	1.61	1.60	1.60	1.60	1.80
Sept.	1.35	2.64	4.00	3.00	2.45	3.10	1.64	2.00	2.50	2.00	1.90	2.00	1.78	1.90	1.95	1.60	1.60	1.60	1.60	1.80
Oct.	1.44	2.75	3.00	3.00	2.45	3.05	1.60	2.00	2.50	1.93	1.90	2.00	1.75	1.90	1.90	1.60	1.60	1.60	1.70	1.80
Nov.	1.60	2.86	3.00	3.00	2.45	2.89	1.54	2.00	2.50	2.00	1.90	2.00	1.77	1.90	1.90	1.60	1.60	1.60	1.70	1.80
Dec.	1.78	3.25	3.00	2.90	2.45	2.45	1.50	2.00	2.50	2.10	1.90	2.00	1.80	1.90	1.90	1.60	1.50	1.60	1.70	1.80
Aver.	1.31	2.55	3.67	2.99	2.52	2.95	1.94	1.71	2.43	2.19	1.99	1.95	1.83	1.87	1.92	1.69	1.62	1.57	1.63	1.78

Tank Plates at Pittsburgh, Cents a Pound

	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan.	1.10	2.25	4.45	3.25	3.00	2.72	2.65	1.48	2.06	2.50	2.00	1.86	1.90	1.81	1.90	1.83	1.64	1.50	1.60	1.70
Feb.	1.10	2.56	4.88	3.25	3.00	3.50	2.33	1.39	2.23	2.45	2.00	1.80	1.86	1.85	1.90	1.80	1.65	1.50	1.60	1.70
March. . . .	1.10	3.10	5.25	3.25	2.91	3.63	2.04	1.39	2.39	2.39	2.00	1.86	1.85	1.85	1.90	1.80	1.65	1.52	1.60	1.70
April	1.15	3.56	5.88	3.25	2.65	3.75	2.10	1.48	2.50	2.28	2.00	1.90	1.85	1.85	1.95	1.80	1.65	1.60	1.55	1.74
May	1.15	3.75	6.60	3.25	2.65	3.75	2.20	1.56	2.50	2.20	2.00	1.86	1.84	1.85	1.95	1.73	1.65	1.60	1.50	1.85
June	1.16	3.63	8.00	3.25	2.65	3.55	1.95	1.63	2.50	2.18	1.92	1.88	1.80	1.85	1.95	1.69	1.65	1.60	1.53	1.85
July	1.22	3.44	9.00	3.25	2.65	3.38	1.85	1.70	2.50	2.09	1.90	1.90	1.80	1.85	1.95	1.65	1.63	1.60	1.60	1.81
Aug.	1.26	3.70	8.80	3.25	2.65	3.25	1.78	1.88	2.50	1.95	1.85	1.90	1.80	1.90	1.95	1.61	1.60	1.60	1.60	1.80
Sept.	1.34	4.00	8.00	3.25	2.53	3.25	1.64	2.13	2.50	1.82	1.80	1.90	1.78	1.90	1.95	1.60	1.60	1.60	1.60	1.80
Oct.	1.44	4.00	3.25	3.25	2.61	3.09	1.60	2.11	2.50	1.80	1.80	1.90	1.75	1.90	1.94	1.60	1.60	1.60	1.70	1.80
Nov.	1.65	4.15	3.25	3.25	2.65	2.81	1.54	1.99	2.50	1.83	1.86	1.90	1.77	1.90	1.90	1.60	1.60	1.60	1.70	1.80
Dec.	2.04	4.25	3.25	3.13	2.65	2.65	1.50	1.95	2.50	1.92	1.90	1.90	1.80	1.90	1.90	1.60	1.54	1.60	1.70	1.80
Aver.	1.31	3.53	5.88	3.24	2.72	3.28	1.93	1.72	2.43	2.12	1.91	1.88	1.82	1.87	1.93	1.69	1.62	1.57	1.61	1.78

Hot-Rolled Annealed Sheets, No. 10 Gage, at Pittsburgh, Cents a Pound

	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan.	3.65	3.55	2.25	2.52	3.00	2.70	2.50	2.25	2.10	2.10	2.10	1.90	1.75	1.62	1.90
Feb.	4.25	3.29	2.25	2.64	3.00	2.70	2.50	2.20	2.10	2.10	2.10	1.90	1.75	1.60	1.90
March. . . .	4.50	3.04	2.25	2.95	2.93	2.69	2.50	2.20	2.10	2.10	2.10	1.90	1.71	1.55	1.90
April	4.50	3.05	2.36	3.25	2.86	2.53	2.43	2.18	2.08	2.10	2.06	1.85	1.70	1.55	1.96
May	4.50	3.10	2.40	3.20	2.80	2.40	2.40	2.22	2.00	2.13	2.00	1.85	1.70	*1.59	2.15
June	4.50	2.88	2.40	3.00	2.76	2.31	2.32	2.25	2.00	2.20	2.00	1.85	1.70	1.65	2.15
July	5.38	2.55	2.40	3.00	2.68	2.30	2.30	2.25	2.00	2.14	2.00	1.85	1.70	1.80	2.03
Aug.	6.00	2.31	2.44	3.00	2.63	2.30	2.30	2.25	2.00	2.10	1.93	1.85	1.70	1.80	2.00
Sept.	5.56	2.23	2.44	3.00	2.69	2.25	2.30	2.25	2.00	2.10	1.90	1.85	1.70	1.83	2.00
Oct.	4.98	2.25	2.60	3.00	2.70	2.26	2.30	2.14	2.00	2.10	1.90	1.85	1.70	1.90	2.00
Nov.	4.54	2.25	2.55	3.00	2.70	2.40	2.30	2.10	2.00	2.10	1.90	1.85	1.70	1.90	2.00
Dec.	3.55	2.25	2.50	3.00	2.70	2.50	2.30	2.10	2.08	2.18	1.90	1.80	1.70	1.90	2.00
Aver.	4.66	2.73	2.41	2.96	2.79	2.45	2.37	2.20	2.04	2.12	1.99	1.86	1.71	1.72	2.00

*Since May, 1933, established by adding extra for annealing to base price for hot-rolled sheets, No. 10 gage.

No. 24 Hot-Rolled Annealed Sheets, at Pittsburgh, Cents a Pound

	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan.	1.80	2.60	4.50	5.00	4.70	4.48	4.35	3.00	3.35	3.83	3.60	3.35	2.91	2.80	2.85	2.65	2.35	2.22	2.02	2.25
Feb.	1.80	2.60	4.69	5.00	4.70	5.00	4.21	3.00	3.46	3.85	3.50	3.27	2.80	2.90	2.85	2.61	2.35	2.15	2.00	2.25
March. . . .	1.80	2.71	4.94	5.00	4.61	5.50	3.88	3.00	3.71	3.78	3.44	3.25	2.75	2.89	2.85	2.65	2.31	2.19	2.00	2.25
April	1.80	2.85	5.75	5.00	4.35	5.50	3.88	3.11	4.00	3.71	3.35	3.25	2.74	2.77	2.85	2.55	2.25	2.20	2.00	2.35
May	1.79	2.89	7.00	5.00	4.35	5.50	4.00	3.15	3.88	3.60	3.20	3.17	2.86	2.71	2.85	2.55	2.15	2.20	2.04	2.65
June	1.75	2.90	7.88	5.00	4.35	5.50	3.80	3.15	3.85	3.53	3.15	3.10	3.00	2.65	2.85	2.55	2.20	2.20	2.10	2.65
July	1.75	2.90	8.50	5.00	4.35	6.75	3.31	3.15	3.81	3.46	3.13	3.10	3.00	2.62	2.85	2.49	2.40	2.20	2.25	2.47
Aug.	1.85	2.90	8.50	5.00	4.34	7.50	2.90	3.23	3.75	3.45	3.15	3.10	3.00	2.65	2.85	2.44	2.40	2.16	2.25	2.40
Sept.	1.90	2.93	8.50	5.00	4.35	7.38	2.81	3.35	3.75	3.50	3.14	*2.90	3.00	2.65	2.85	2.42	2.40	2.10	2.25	2.40
Oct.	2.03	3.23	5.05	5.05	4.35	6.69	3.00	3.47	3.75	3.50	3.11	2.97	2.90	2.75	2.77	2.36	2.40	2.17	2.25	2.40
Nov.	2.25	3.65	5.00	5.00	4.35	5.77	2.86	3.35	3.75	3.50	3.25	3.00	2.78	2.75	2.75	2.35	2.40	2.10	2.25	2.40
Dec.	2.50	4.31	5.00	4.85	4.35	4.35	3.00	3.35	3.75	3.54	3.33	3.00	2.77	2.83	2.75	2.35	2.35	2.10	2.25	2.40
Aver.	1.92	3.04	6.39	4.99	4.43	5.83	3.50	3.19	3.73	3.60	3.28	2.95	2.88	2.75	2.83	2.50	2.33	2.17	2.14	2.81

*No. 24 gage was made the base in September, 1926; prices prior to that time are for No. 28 gage.

No. 24 Gage Galvanized Sheets, at Pittsburgh, Cents a Pound

	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan. . .	2.79	4.75	6.25	6.25	6.05	5.33	5.70	4.00	4.35	4.98	4.75	4.60	3.78	3.65	3.60	3.33	2.90	2.80	2.68	2.85
Feb. . .	3.16	4.75	6.38	6.25	6.05	6.50	5.56	4.00	4.54	5.00	4.75	4.53	3.71	3.65	3.60	3.30	2.90	2.75	2.50	2.85
March. .	3.40	4.75	6.69	6.25	5.96	7.00	5.05	4.00	4.93	4.93	4.62	4.50	3.65	3.65	3.60	3.30	2.90	2.85	2.60	2.85
April . .	3.29	5.00	7.00	6.25	5.70	7.00	4.88	4.11	5.25	4.88	4.45	4.50	3.63	3.65	3.60	3.30	2.84	2.85	2.63	2.95
May . . .	3.50	4.94	8.20	6.25	5.70	7.00	5.00	4.15	5.20	4.80	4.29	4.43	3.72	3.58	3.60	3.23	2.80	2.85	2.70	3.25
June . . .	4.28	4.69	9.50	6.25	5.70	7.00	4.88	4.15	5.00	4.76	4.21	4.28	3.85	3.50	3.60	3.19	2.74	2.85	2.70	3.25
July . . .	4.40	4.38	10.00	6.25	5.70	8.25	4.31	4.15	5.00	4.56	4.19	4.24	3.85	3.46	3.60	3.13	2.90	2.85	2.85	3.12
Aug. . . .	3.71	4.21	10.00	6.25	5.70	9.00	3.90	4.23	5.00	5.55	4.20	4.23	3.85	3.40	3.50	3.05	2.90	2.81	2.85	3.10
Sept. . . .	3.56	4.18	9.75	6.25	5.70	8.88	3.81	4.35	5.00	4.60	4.20	4.33	3.85	3.40	3.50	3.00	2.90	2.75	2.85	3.10
Oct.	3.50	4.41		6.25	5.70	8.18	4.00	4.50	5.00	4.60	4.23	3.85	3.76	3.50	3.50	2.99	2.90	2.85	2.85	3.10
Nov.	3.89	5.18	6.25	6.25	5.70	7.04	3.86	4.43	4.93	4.60	4.50	3.85	3.66	3.50	3.48	2.95	2.90	2.85	2.85	3.10
Dec.	4.75	6.00	6.25	6.15	5.70	5.70	4.00	4.35	4.89	4.72	4.60	3.85	3.63	3.58	3.40	2.92	2.86	2.85	2.85	3.10
Aver. . . .	3.69	4.77	7.84	6.24	5.78	7.24	4.58	4.20	4.92	4.75	4.42	3.89	3.75	3.54	3.55	3.14	2.87	2.83	2.74	3.04

Hot-Rolled Strip Steel, at Pittsburgh, Cents a Pound

(Prices quoted only on strip wider than 6-in. prior to June 1, 1932.)

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan.		4.50	3.30	3.45	3.30	2.00	2.75	3.00	2.25	2.30	2.34	2.01	1.80	1.80	1.55	1.41	1.45	1.75
Feb.		4.50	3.30	4.63	3.11	1.84	2.86	3.00	2.35	2.30	2.21	2.08	1.80	1.80	1.55	1.40	1.45	1.75
March		4.50	3.30	5.00	2.93	1.81	3.18	2.93	2.40	2.30	2.30	2.10	1.80	1.79	1.55	1.40	1.45	1.75
April		4.50	3.30	5.25	2.76	1.98	3.30	2.75	2.40	2.30	2.30	2.10	1.90	1.70	1.55	1.40	1.45	1.81
May		4.25	3.30	5.50	2.53	2.20	2.30	2.75	2.20	2.30	2.30	1.96	1.90	1.70	1.55	1.40	1.49	2.00
June		3.50	3.05	5.50	2.50	2.40	3.23	2.50	2.20	2.30	2.30	1.85	1.90	1.69	1.55	1.41	1.55	2.00
July		3.50	3.05	5.50	2.46	2.50	3.00	2.50	2.20	2.30	2.30	1.85	1.90	1.65	1.55	1.45	1.60	1.88
Aug.		3.50	3.31	5.50	2.23	2.60	3.00	2.35	2.20	2.30	2.30	1.85	1.90	1.65	1.65	1.45	1.64	1.85
Sept.		3.50	3.30	5.50	2.00	2.75	3.00	2.25	2.20	2.30	2.30	1.85	1.90	1.65	1.55	1.45	1.68	1.85
Oct.		3.50	3.30	5.25	2.00	2.90	3.00	2.25	2.23	2.30	2.19	1.85	1.90	1.60	1.54	1.45	1.75	1.85
Nov.	4.50	3.50	3.30	4.70	2.00	2.83	3.00	2.25	2.30	2.30	2.10	1.88	1.90	1.58	1.50	1.45	1.75	1.85
Dec.	4.50	3.50	3.30	3.65	2.00	2.75	2.88	2.25	2.30	2.30	2.03	1.80	1.90	1.55	1.49	1.45	1.75	1.85
Aver.		3.90	3.26	4.95	2.49	2.38	3.04	2.57	2.27	2.30	2.26	1.93	1.88	1.68	1.54	1.43	1.58	1.85

Cold-Rolled Strip Steel, at Pittsburgh, Cents a Pound

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan.	7.00	6.50	6.25	6.00	6.25	3.50	4.50	5.00	4.00	3.90	2.95	3.00	2.85	2.65	2.25	1.92	1.88	2.40
Feb.	7.25	6.50	6.25	7.00	6.06	3.50	4.69	4.75	4.00	3.90	2.80	3.00	2.85	2.65	2.25	1.90	1.80	2.40
March	7.63	6.50	6.10	7.00	5.83	3.50	5.00	4.75	4.00	3.90	2.92	3.00	2.80	2.60	2.25	1.96	1.80	2.40
April	7.31	6.50	5.65	7.75	5.54	3.61	5.25	4.75	4.00	3.79	3.00	3.00	2.75	2.55	2.23	2.09	1.80	2.50
May	7.60	6.50	5.65	8.50	4.98	3.71	5.25	4.50	3.94	3.75	3.00	3.00	2.75	2.50	2.15	2.00	1.88	2.80
June	8.63	6.50	5.65	8.50	4.88	4.00	5.19	4.50	3.53	3.72	3.19	3.00	2.75	2.45	2.15	2.00	2.00	2.80
July	9.00	6.50	5.65	8.50	4.25	4.00	5.00	4.30	3.63	3.60	3.25	2.92	2.75	2.45	2.15	2.00	2.19	2.64
Aug.	9.00	6.50	5.65	8.50	3.96	4.10	5.00	4.13	3.75	3.60	3.25	2.90	2.75	2.35	2.15	2.00	2.25	2.60
Sept.	9.00	6.50	5.65	8.50	3.78	4.25	5.00	4.00	3.75	3.50	3.25	2.72	2.75	2.35	2.15	1.92	2.29	2.60
Oct.	9.00	6.50	5.65	8.25	3.75	4.50	5.00	4.00	3.75	3.25	3.00	2.75	2.75	2.35	2.13	1.90	2.40	2.60
Nov.	6.75	6.50	5.65	8.00	3.75	4.50	4.98	4.00	3.90	3.25	3.00	2.85	2.75	2.33	2.05	2.00	2.40	2.60
Dec.	6.50	6.35	5.93	6.63	3.75	4.50	4.91	4.00	3.90	3.00	3.00	2.85	2.75	2.25	2.03	2.00	2.40	2.60
Aver.	7.89	6.49	5.81	7.76	4.73	3.97	4.98	4.39	3.85	3.60	3.05	2.92	2.77	2.46	2.16	1.97	2.09	2.58

Tin Plate at Pittsburgh, Dollars a Base Box

	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan.	\$3.10	\$3.75	\$7.00	\$7.75	\$7.35	\$7.00	\$7.00	\$4.75	\$4.75	\$5.50	\$5.50	\$5.50	\$5.50	\$5.25	\$5.35	\$5.25	\$5.00	\$4.75	\$4.25	\$5.25
Feb.	3.10	3.96	7.38	7.75	7.35	7.00	7.00	4.71	4.80	5.50	5.50	5.50	5.50	5.25	5.75	5.25	5.00	4.75	4.25	5.25
March	3.25	4.19	8.00	7.75	7.26	7.00	7.00	4.60	5.23	5.50	5.50	5.50	5.50	5.25	5.45	5.25	5.00	4.75	4.25	5.25
April	3.25	4.50	8.00	7.75	7.00	7.00	6.44	4.75	6.00	5.50	5.50	5.50	5.50	5.25	5.35	5.25	5.00	4.75	4.25	5.25
May	3.15	5.30	8.40	7.75	7.00	7.00	6.25	4.75	5.70	5.50	5.50	5.50	5.50	5.25	5.35	5.25	5.00	4.75	4.25	5.25
June	3.11	5.81	10.50	7.75	7.00	7.00	6.25	4.75	5.50	5.50	5.50	5.50	5.50	5.25	5.35	5.25	5.00	4.75	4.25	5.25
July	3.10	6.00	12.00	7.75	7.00	7.50	5.69	4.75	5.50	5.50	5.50	5.50	5.50	5.25	5.35	5.25	5.00	4.75	4.25	5.25
Aug.	3.10	5.95	11.40	7.75	7.00	9.00	5.25	4.75	5.50	5.50	5.50	5.50	5.50	5.25	5.35	5.25	5.00	4.75	4.25	5.25
Sept.	3.15	5.75	12.00	7.75	7.00	9.00	5.25	4.75	5.50	5.50	5.50	5.50	5.50	5.25	5.35	5.25	5.00	4.75	4.65	5.25
Oct.	3.15	5.81	...	7.75	7.00	8.33	5.13	4.75	5.50	5.50	5.50	5.50	5.50	5.25	5.35	5.00	4.75	4.75	4.65	5.25
Nov.	3.28	5.97	7.75	7.75	7.00	7.50	4.75	4.75	5.50	5.50	5.50	5.50	5.50	5.25	5.35	5.00	4.75	4.55	4.65	5.25
Dec.	3.52	6.63	7.75	7.55	7.00	7.00	4.73	4.75	5.50	5.50	5.50	5.50	5.25	5.25	5.35	5.00	4.75	4.25	5.25	5.25
Aver.	3.19	5.30	9.11	7.73	7.08	7.53	5.90	4.73	5.42	5.50	5.50	5.50	5.48	5.25	5.35	5.19	4.94	4.69	4.43	5.25

Wire Nails at Pittsburgh, Keg of 100 Lb.

	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan.	\$1.54	\$2.13	\$3.00	\$3.50	\$3.50	\$4.50	\$3.25	\$2.50	\$2.70	\$3.00	\$2.85	\$2.65	\$2.64	\$2.54	\$2.65	\$2.33	\$1.90	\$1.95	\$1.86	\$2.35
Feb.	1.57	2.25	3.00	3.50	3.50	4.50	3.21	2.40	2.78	3.00	2.85	2.65	2.56	2.63	2.65	2.25	1.90	1.95	1.83	2.35
March	1.60	2.40	3.20	3.50	3.44	4.00	3.02	2.40	2.83	3.00	2.85	2.65	2.55	2.65	2.65	2.25	1.90	1.95	1.85	2.35
April	1.56	2.40	3.28	3.50	3.25	4.00	3.13	2.40	2.93	3.00	2.80	2.65	2.55	2.65	2.65	2.16	1.90	1.95	1.85	2.41
May	1.55	2.50	3.50	3.50	3.25	4.00	3.05	2.40	3.00	2.93	2.75	2.65	2.50	2.55	2.65	2.15	1.85	1.95	1.85	2.60
June	1.55	2.50	3.75	3.50	3.25	4.00	3.00	2.40	3.00	2.90	2.68	2.65	2.50	2.55	2.65	2.13	1.80	1.95	1.85	2.60
July	1.60	2.50	4.00	3.50	3.25	4.00	2.81	2.40	3.00	2.88	2.65	2.65	2.53	2.55	2.64	2.05	1.80	1.95	2.04	2.60
Aug.	1.61	2.58	4.00	3.50	3.25	4.25	2.75	2.48	3.00	2.81	2.65	2.65	2.55	2.55	2.55	2.04	1.88	1.95	2.10	2.60
Sept.	1.69	2.60	4.00	3.50	3.25	4.25	2.86	2.63	3.00	2.78	2.65	2.65	2.55	2.55	2.50	2.00	1.90	1.95	2.10	2.60
Oct.	1.80	2.63	...	3.50	3.31	4.25	2.90	2.70	3.00	2.75	2.63	2.65	2.54	2.55	2.43	1.99	1.90	1.95	2.10	2.60
Nov.	1.87	2.85	3.50	3.50	3.50	4.05	2.84	2.70	3.00	2.75	2.65	2.65	2.50	2.55	2.40	1.93	1.90	1.95	2.10	2.60
Dec.	2.04	3.00	3.50	3.50	4.12	3.25	2.69	2.70	3.00	2.85	2.65	2.65	2.50	2.50	2.40	1.90	1.93	1.95	2.35	2.60
Aver.	1.67	2.53	3.52	3.50	3.41	4.09	2.96	2.51	2.94	2.89	2.72	2.65	2.54	2.58	2.57	2.10	1.88	1.95	1.99	2.52

Plain Wire, Base, at Pittsburgh, Cents a Pound

	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan.	1.34	1.98	2.95	3.25	3.25	3.25	3.25	2.25	2.45	2.75	2.60	2.50	2.49	2.40	2.50	2.40	2.20	2.20	2.16	2.20
Feb.	1.39	2.10	2.95	3.25	3.25	3.50	3.13	2.20	2.63	2.75	2.60	2.50	2.41	2.48	2.50	2.40	2.20	2.20	2.10	2.20
March. . . .	1.40	2.25	3.11	3.25	3.19	3.50	3.00	2.25	2.65	2.75	2.60	2.50	2.40	2.50	2.50	2.40	2.20	2.20	2.10	2.20
April	1.37	2.25	3.23	3.25	3.00	3.50	3.00	2.25	2.68	2.75	2.50	2.50	2.40	2.50	2.50	2.38	2.20	2.20	2.10	2.23
May	1.35	2.45	3.45	3.25	3.00	3.50	3.00	2.25	2.75	2.68	2.50	2.50	2.40	2.50	2.50	2.30	2.20	2.20	2.10	2.30
June	1.35	2.45	3.70	3.25	3.00	3.50	2.75	2.25	2.75	2.65	2.49	2.50	2.40	2.50	2.50	2.30	2.20	2.20	2.10	2.30
July	1.39	2.45	3.95	3.25	3.00	3.50	2.56	2.25	2.75	2.63	2.50	2.50	2.40	2.42	2.50	2.30	2.20	2.20	2.10	2.30
Aug.	1.43	2.53	3.95	3.25	3.00	3.69	2.50	2.29	2.75	2.56	2.50	2.50	2.40	2.40	2.43	2.30	2.20	2.20	2.10	2.30
Sept.	1.54	2.55	3.95	3.25	3.00	3.75	2.58	2.39	2.75	2.53	2.50	2.50	2.40	2.40	2.40	2.30	2.20	2.20	2.10	2.30
Oct.	1.65	2.60	3.25	3.25	3.17	3.75	2.60	2.45	2.75	2.50	2.50	2.50	2.40	2.40	2.40	2.30	2.20	2.20	2.10	2.30
Nov.	1.72	2.80	3.25	3.25	3.29	3.65	2.56	2.45	2.75	2.50	2.50	2.50	2.40	2.40	2.40	2.30	2.20	2.20	2.10	2.30
Dec.	1.89	2.95	3.25	3.25	3.21	3.25	2.44	2.45	2.75	2.60	2.50	2.50	2.40	2.48	2.40	2.22	2.20	2.20	2.20	2.30
Aver. 1.48		2.47	3.43	3.25	3.11	3.53	2.78	2.31	2.70	2.61	2.52	2.50	2.41	2.45	2.46	2.33	2.20	2.20	2.11	2.22

Finished Iron and Steel at Chicago

Soft Steel Bars at Chicago, Cents a Pound										
	1926	1927	1928	1929	1930	1931	1932	1933	1934	
Jan. ...	2.10	2.10	1.91	2.00	1.99	1.71	1.68	1.70	1.80	
Feb. ...	2.10	2.03	1.95	2.01	1.95	1.72	1.65	1.70	1.80	
March ...	2.10	2.00	1.98	2.05	1.95	1.70	1.68	1.70	1.80	
April ...	2.10	2.00	2.00	2.05	1.91	1.75	1.70	1.70	1.84	
May ...	2.10	2.00	2.00	2.05	1.85	1.70	1.70	1.70	1.95	
June ...	2.10	2.00	2.00	2.05	1.83	1.70	1.70	1.70	1.95	
July ...	2.10	2.00	2.00	2.05	1.75	1.70	1.70	1.70	1.87	
Aug. ...	2.10	1.98	2.00	2.05	1.75	1.70	1.70	1.69	1.85	
Sept. ...	2.10	1.90	2.00	2.05	1.71	1.70	1.70	1.65	1.85	
Oct. ...	2.10	1.85	2.00	2.03	1.70	1.70	1.70	1.80	1.85	
Nov. ...	2.10	1.87	2.00	2.00	1.70	1.70	1.70	1.80	1.85	
Dec. ...	2.10	1.90	2.00	2.00	1.70	1.60	1.70	1.80	1.85	
Aver. ...	2.10	1.97	1.99	2.03	1.82	1.70	1.69	1.72	1.86	

Structural Shapes at Chicago, Cents a Pound										
	1926	1927	1928	1929	1930	1931	1932	1933	1934	
Jan. ...	2.10	2.10	1.91	2.00	1.99	1.71	1.68	1.70	1.75	
Feb. ...	2.10	2.03	1.95	2.01	1.95	1.72	1.65	1.70	1.75	
March ...	2.10	2.00	1.98	2.05	1.94	1.70	1.68	1.70	1.75	
April ...	2.10	2.00	2.00	2.05	1.90	1.75	1.70	1.70	1.75	
May ...	2.10	2.00	2.00	2.05	1.83	1.70	1.70	1.70	1.90	
June ...	2.00	2.00	2.00	2.05	1.79	1.70	1.70	1.70	1.90	
July ...	2.10	2.00	2.00	2.05	1.75	1.70	1.70	1.70	1.86	
Aug. ...	2.10	1.94	2.00	2.05	1.75	1.70	1.70	1.69	1.85	
Sept. ...	2.10	1.90	2.00	2.05	1.71	1.70	1.70	1.65	1.85	
Oct. ...	2.10	1.85	2.00	2.03	1.70	1.70	1.70	1.75	1.85	
Nov. ...	2.10	1.87	2.00	2.00	1.70	1.70	1.70	1.75	1.85	
Dec. ...	2.10	1.90	2.00	2.00	1.70	1.60	1.70	1.75	1.85	
Aver. ...	2.10	1.97	1.99	2.03	1.81	1.70	1.69	1.71	1.83	

Rail Steel Bars at Chicago District Mill, Cents a Pound										
	1926	1927	1928	1929	1930	1931	1932	1933	1934	
Jan. ...	2.00	1.90	1.80	1.90	1.88	1.60	1.50	1.50	1.70	
Feb. ...	2.00	1.90	1.80	1.95	1.80	1.60	1.50	1.50	1.70	
March ...	2.00	1.90	1.80	1.95	1.85	1.60	1.50	1.50	1.70	
April ...	2.00	1.90	1.83	1.95	1.81	1.60	1.50	1.50	1.74	
May ...	1.98	1.90	1.85	1.95	1.80	1.60	1.50	1.50	1.85	
June ...	1.96	1.90	1.86	1.95	1.75	1.60	1.50	1.50	1.86	
July ...	1.98	1.90	1.85	1.95	1.75	1.60	1.50	1.50	1.79	
Aug. ...	2.00	1.90	1.85	1.95	1.65	1.60	1.50	1.51	1.75	
Sept. ...	2.00	1.90	1.85	1.95	1.65	1.60	1.50	1.55	1.75	
Oct. ...	2.00	1.83	1.95	1.95	1.65	1.54	1.50	1.70	1.75	
Nov. ...	1.96	1.80	1.95	1.94	1.64	1.50	1.50	1.70	1.75	
Dec. ...	1.90	1.80	1.95	1.90	1.60	1.50	1.50	1.70	1.75	
Aver. ...	1.98	1.88	1.86	1.94	1.74	1.58	1.50	1.56	1.76	

Common Bar Iron at Chicago, Cents a Pound										
	1926	1927	1928	1929	1930	1931	1932	1933	1934	
Jan. ...	2.00	2.00	1.90	2.00	1.98	1.71	1.68	1.60	1.60	
Feb. ...	2.00	2.00	1.93	2.00	1.95	1.73	1.70	1.60	1.60	
March ...	2.00	2.00	2.00	2.04	1.95	1.70	1.70	1.60	1.60	
April ...	2.00	2.00	2.00	2.05	1.92	1.74	1.70	1.60	1.60	
May ...	2.00	2.00	2.00	2.05	1.90	1.70	1.66	1.60	1.69	
June ...	2.00	2.00	2.00	2.05	1.90	1.70	1.65	1.60	1.85	
July ...	2.00	2.00	2.00	2.05	1.90	1.70	1.65	1.60	1.84	
Aug. ...	2.00	2.00	2.00	2.05	1.75	1.70	1.62	1.60	1.80	
Sept. ...	2.00	1.98	2.00	2.05	1.74	1.70	1.60	1.60	1.80	
Oct. ...	2.00	1.88	2.00	2.04	1.70	1.70	1.60	1.60	1.80	
Nov. ...	2.00	1.88	2.00	2.00	1.70	1.70	1.60	1.60	1.80	
Dec. ...	2.00	1.90	2.00	2.00	1.70	1.60	1.60	1.60	1.80	
Aver. ...	2.00	1.97	1.99	2.03	1.84	1.70	1.65	1.60	1.76	

No. 24 Gage Hot-Rolled Annealed Sheets at Chicago District Mills, Cents a Pound										
	1926	1927	1928	1929	1930	1931	1932	1933	1934	
Jan. ...	3.50	3.20	3.03	3.00	2.85	2.45	2.35	2.12	2.35	
Feb. ...	3.50	2.98	3.05	3.00	2.80	2.45	2.25	2.00	2.35	
March ...	3.50	3.00	3.05	3.10	2.80	2.41	2.29	2.10	2.35	
April ...	3.48	3.00	3.01	3.10	2.70	2.35	2.30	2.10	2.45	
May ...	3.40	3.12	2.87	3.10	2.70	2.35	2.30	2.14	2.75	
June ...	3.31	3.15	2.83	3.10	2.70	2.35	2.30	2.20	2.75	
July ...	3.30	3.15	2.80	3.10	2.69	2.50	2.30	2.35	2.57	
Aug. ...	3.30	3.15	2.80	3.05	2.55	2.50	2.30	2.35	2.50	
Sept. ...	3.07	3.15	2.80	3.00	2.52	2.50	2.26	2.35	2.50	
Oct. ...	3.18	3.05	2.86	3.00	2.53	2.50	2.28	2.35	2.50	
Nov. ...	3.25	2.94	2.90	2.88	2.45	2.50	2.20	2.35	2.50	
Dec. ...	3.25	2.90	2.93	2.80	2.45	2.45	2.20	2.35	2.50	
Aver. ...	3.34	3.07	2.91	3.02	2.65	2.44	2.28	2.23	2.91	

*No. 28 gage to September, 1926; subsequent quotations for No. 24 gage.

Galvanized Sheets at Chicago District Mill, Cents a Pound										
	1926	1927	1928	1929	1930	1931	1932	1933	1934	
Jan. ...	4.75	4.03	3.88	3.75	3.60	3.00	2.90	2.76	2.95	
Feb. ...	4.75	3.90	3.90	3.75	3.40	3.00	2.87	2.55	2.95	
March ...	4.75	3.90	3.90	3.85	3.40	3.00	2.93	2.70	2.95	
April ...	4.75	3.90	3.86	3.85	3.40	3.00	2.95	2.73	3.05	
May ...	4.68	3.98	3.75	3.85	3.33	2.90	2.95	2.86	3.35	
June ...	4.55	4.00	3.70	3.85	3.29	2.87	2.95	2.95	3.35	
July ...	4.45	4.00	3.65	3.85	3.25	3.00	2.95	2.95	3.23	
Aug. ...	4.45	4.00	3.65	3.70	3.18	3.00	2.91	2.95	3.20	
Sept. ...	3.94	4.00	3.65	3.65	3.10	3.00	2.85	2.95	3.20	
Oct. ...	4.04	3.95	3.65	3.65	3.10	3.00	2.95	2.95	3.20	
Nov. ...	4.10	3.85	3.65	3.60	3.10	3.00	2.95	2.95	3.20	
Dec. ...	4.10	3.70	3.68	3.50	3.04	2.96	2.95	2.95	3.20	
Aver. ...	4.44	3.93	3.74	3.74	3.27	2.97	2.93	2.85	3.15	

*No. 28 gage to September, 1926; subsequent quotations for No. 24 gage.

Wrought Iron Pipe at Pittsburgh, Net Ton

Computed from list discounts, for carload lots; price for base size pipe, 1½ in.; 1½ and 2 in. prior to Oct. 1, 1932.																	
	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan. . .	\$122.27	\$116.71	\$115.60	\$135.06	\$100.96	\$122.56	\$131.10	\$131.10	\$127.82	\$127.82	\$127.82	\$118.56	\$118.56	\$118.56	\$118.56	\$120.00	\$113.00
Feb. . .	122.27	116.71	119.49	136.16	100.96	127.82	131.10	131.10	127.82	127.82	127.82	118.56	118.56	118.56	116.71	120.00	113.00
March. . .	122.27	114.41	119.49	136.16	100.96	127.82	131.10	127.82	127.82	127.82	127.82	118.56	118.56	118.56	114.85	120.00	113.00
April. . .	122.27	110.22	119.49	125.66	100.96	129.02	131.10	127.82	127.82	127.82	127.82	118.56	118.56	118.56	114.85	114.75	113.00
May . . .	122.27	110.22	119.49	117.63	100.96	131.10	131.10	127.82	127.82	127.82	127.82	118.56	118.56	118.56	114.85	113.00	113.00
June . . .	122.27	110.22	119.49	117.63	100.96	131.10	131.10	127.82	127.82	127.82	127.82	118.56	118.56	118.56	114.85	113.00	113.00
July . . .	122.27	110.22	119.49	111.65	100.96	131.10	131.10	127.82	127.82	127.82	127.82	118.56	118.56	118.56	114.85	113.00	113.00
Aug. . .	122.27	110.22	119.49	110.22	105.74	131.10	131.10	127.82	127.82	127.82	127.82	118.56	118.56	118.56	114.85	113.00	113.00
Sept. . .	122.27	110.22	119.49	105.59	116.33	131.10	131.10	127.82	127.82	127.82	127.82	118.56	118.56	118.56	116.14	113.00	113.00
Oct. . .	122.27	110.22	119.49	100.96	120.41	131.10	131.10	127.82	127.82	127.82	127.82	118.56	118.56	118.56	120.00	113.00	113.00
Nov. . .	122.27	110.22	119.49	100.96	120.41	131.10	131.10	127.82	127.82	127.82	127.82	118.56	118.56	118.56	120.00	113.00	113.00
Dec. . .	122.27	110.22	119.49	100.96	120.41	131.10	131.10	127.82	127.82	127.82	127.82	118.56	118.56	118.56	120.00	113.00	113.00
Aver. . .	122.27	111.65	119.16	116.55	107.50	129.67	131.10	128.37	127.82	127.82	127.82	118.56	118.56	118.56	116.71	114.90	113.00

Cast Iron Pipe, Net Ton

At New York, 6-in. and Larger			
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No. 1 Heavy Melting Steel Scrap Composite Price

(Average of Pittsburgh, Chicago and Philadelphia Quotations, Gross Ton)

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan. ...	\$29.93	\$17.77	\$25.13	\$14.04	\$12.45	\$20.22	\$19.15	\$20.10	\$16.97	\$15.17	\$13.70	\$17.02	\$14.65	\$11.30	\$8.41	\$6.77	\$11.73
Feb. ...	29.92	14.75	26.00	15.21	12.46	21.46	19.21	18.27	15.50	14.58	13.71	16.96	14.92	11.15	8.27	6.83	12.25
March ...	29.58	14.52	25.50	13.17	13.46	24.79	17.56	16.92	15.83	14.65	13.65	16.71	14.88	11.10	8.23	6.96	12.82
April ...	28.47	15.79	24.42	11.63	14.71	24.00	15.20	15.48	15.27	14.71	13.81	17.18	14.30	10.83	8.12	7.73	12.54
May ...	28.79	15.06	23.71	12.20	15.67	20.77	14.71	15.46	14.35	13.95	13.90	16.54	13.71	9.94	7.48	9.70	11.57
June ...	28.87	16.54	23.47	11.47	15.52	18.94	14.88	16.09	14.40	13.60	13.52	16.39	13.31	9.39	6.89	9.97	10.67
July ...	29.00	19.13	24.21	11.00	15.92	17.23	16.00	16.46	15.42	13.48	13.13	16.60	13.08	9.25	6.46	11.27	10.53
Aug. ...	29.00	20.25	25.88	11.57	16.30	16.58	16.58	17.23	15.88	13.80	13.75	16.86	13.29	9.25	6.93	12.08	10.15
Sept. ...	29.00	18.87	26.53	12.15	18.33	16.98	17.20	17.42	16.25	13.92	14.75	16.60	13.70	9.12	7.69	11.35	9.63
Oct. ...	29.00	18.67	23.73	12.88	19.20	15.15	17.08	17.08	15.58	13.48	15.85	15.78	12.77	8.78	7.62	10.56	9.54
Nov. ...	28.50	20.50	20.00	12.73	18.02	15.13	18.17	17.63	15.25	13.18	15.97	14.15	11.28	8.61	7.45	9.94	10.04
Dec. ...	25.00	22.77	15.92	12.29	17.94	17.37	20.08	17.37	15.08	13.48	15.97	14.15	11.28	8.61	6.92	10.50	11.40
Aver. ...	28.76	17.89	23.71	12.61	15.83	19.05	17.15	17.12	15.48	14.00	14.29	16.30	13.45	9.79	7.54	9.47	11.07

Scrap Prices at Pittsburgh, Gross Ton No. 1 Heavy Melting Steel

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan. ...	\$30.00	\$19.00	\$26.30	\$15.50	\$14.30	\$21.80	\$21.38	\$21.50	\$18.63	\$16.88	\$15.10	\$19.31	\$16.69	\$13.19	\$10.22	\$8.30	\$13.00
Feb. ...	30.00	14.75	27.75	16.00	14.00	23.25	20.88	19.50	17.50	16.13	14.94	18.63	16.81	12.88	10.25	8.50	14.00
March ...	30.00	14.00	27.25	14.00	15.13	25.38	19.38	18.50	17.55	16.55	14.81	18.44	16.56	12.80	10.25	8.88	14.44
April ...	28.50	15.20	26.00	12.63	16.38	25.88	16.20	17.00	16.63	16.50	15.31	18.60	15.95	12.39	10.12	10.00	14.19
May ...	28.50	14.75	25.00	13.30	17.30	22.80	15.63	16.75	15.69	15.40	15.25	17.88	15.25	11.25	9.60	11.75	12.80
June ...	28.62	17.12	25.00	12.69	17.00	21.13	16.00	17.30	15.75	14.81	14.56	18.25	15.13	10.30	8.75	11.75	11.75
July ...	29.00	19.70	26.00	12.00	17.38	18.10	17.50	18.00	16.81	15.00	14.10	18.55	14.75	10.56	8.25	12.72	11.75
Aug. ...	29.00	21.00	28.13	12.79	17.75	17.75	17.50	18.88	17.50	15.40	15.50	19.00	15.13	10.69	8.60	13.85	11.31
Sept. ...	29.00	19.20	29.00	13.63	20.13	17.88	18.10	18.70	17.88	15.50	16.56	18.31	15.60	10.65	9.54	12.94	10.75
Oct. ...	29.00	19.00	27.75	14.13	21.40	15.70	18.50	18.50	17.25	14.75	17.60	17.30	14.56	10.22	9.62	12.15	10.35
Nov. ...	28.87	22.25	23.50	14.30	20.50	16.13	19.63	19.50	17.20	14.25	17.19	16.39	13.19	10.22	9.15	11.50	10.94
Dec. ...	26.87	24.25	17.20	14.25	20.13	18.75	21.40	19.10	16.75	14.88	17.90	15.45	12.75	10.25	8.75	12.13	13.01
Aver. ...	28.95	18.35	25.74	13.76	17.62	20.38	18.51	18.60	17.10	15.50	15.74	18.01	15.20	11.28	9.42	11.21	12.36

Compressed Sheets

	1927	1928	1929	1930	1931	1932	1933	1934
Jan. ...	\$15.50	\$14.15	\$18.81	\$16.39	\$12.50	\$9.56	\$8.00	\$12.35
Feb. ...	15.06	14.06	18.31	16.19	12.56	9.56	8.13	13.44
March ...	15.45	14.56	18.25	15.75	12.55	9.70	8.44	14.13
April ...	15.56	14.94	18.55	15.60	11.94	9.50	9.50	13.88
May ...	14.40	14.90	17.81	15.06	10.88	8.95	11.15	12.45
June ...	13.75	14.25	18.13	14.81	9.75	8.12	11.50	11.00
July ...	14.31	13.60	18.25	14.65	10.06	7.50	12.19	11.00
Aug. ...	14.45	14.75	18.44	14.94	10.13	7.80	13.05	10.81
Sept. ...	14.50	16.39	18.19	14.95	10.35	9.25	12.63	10.44
Oct. ...	14.50	17.15	17.15	14.19	9.63	9.12	11.90	10.10
Nov. ...	13.70	17.00	16.13	12.81	9.75	8.65	11.25	10.63
Dec. ...	13.94	17.80	15.15	12.00	9.80	8.31	11.63	12.44
Aver. ...	14.59	15.30	17.77	14.78	10.86	8.83	10.78	11.89

Low-Phosphorus Scrap (Billet and Bloom Crops)

	1927	1928	1929	1930	1931	1932	1933	1934
Jan. ...	\$21.00	\$18.50	\$22.00	\$20.88	\$17.25	\$13.00	\$10.70	\$15.70
Feb. ...	20.25	18.50	22.00	21.25	18.00	13.00	10.50	16.25
March ...	20.30	18.50	22.50	21.50	18.00	13.00	10.50	17.00
April ...	21.00	18.50	23.45	21.40	17.50	13.00	11.00	17.00
May ...	20.00	18.60	22.50	19.88	15.00	12.40	13.80	16.20
June ...	19.25	19.00	22.25	19.13	14.10	10.87	14.00	15.25
July ...	19.00	19.00	22.45	19.20	14.50	10.50	15.00	15.00
Aug. ...	19.00	19.13	23.00	19.33	14.50	10.50	16.80	14.25
Sept. ...	20.00	19.88	22.39	20.00	14.30	10.50	15.75	13.50
Oct. ...	19.25	20.20	21.75	18.75	13.50	11.00	15.20	13.00
Nov. ...	18.30	20.50	21.13	17.13	13.00	11.50	15.00	13.81
Dec. ...	18.50	21.00	20.75	17.00	13.00	11.00	15.06	14.81
Aver. ...	19.65	19.28	22.18	19.63	15.22	11.69	13.61	15.15

Machine Shop Turnings

	1927	1928	1929	1930	1931	1932	1933	1934
Jan. ...	\$12.00	\$10.80	\$11.50	\$11.50	\$6.00	\$6.50	\$6.25	\$8.70
Feb. ...	11.38	10.88	11.50	11.39	6.44	6.50	6.25	10.25
March ...	12.00	10.25	10.63	10.94	7.65	6.75	6.25	11.00
April ...	12.63	10.44	11.15	10.90	7.06	6.56	6.81	10.38
May ...	11.30	10.20	11.06	10.19	6.57	6.00	8.30	8.35
June ...	10.50	9.00	11.63	9.56	6.50	5.12	8.38	7.25
July ...	11.50	9.10	11.90	8.60	6.75	4.75	9.50	7.50
Aug. ...	11.80	9.88	13.00	8.00	7.00	5.30	10.50	7.50
Sept. ...	11.63	11.13	12.06	8.00	7.30	6.00	10.00	7.13
Oct. ...	11.50	11.10	11.75	6.88	7.00	6.00	9.30	6.75
Nov. ...	11.10	11.00	11.00	6.00	6.94	6.00	7.75	7.13
Dec. ...	11.00	11.10	10.25	6.00	6.70	6.12	8.00	8.75
Aver. ...	11.53	10.41	11.45	8.98	6.83	5.97	8.11	8.39

Cast Iron Borings

	1927	1928	1929	1930	1931	1932	1933	1934
Jan. ...	\$12.50	\$11.30	\$12.88	\$11.25	\$7.50	\$6.50	\$5.50	\$7.50
Feb. ...	12.13	11.00	12.50	11.56	7.50	6.50	5.50	7.88
March ...	12.50	10.50	12.25	11.00	7.70	6.70	5.50	8.50
April ...	12.38	11.00	12.45	10.55	7.50	6.56	5.88	8.50
May ...	11.10	10.90	12.00	10.39	7.63	6.10	7.30	8.10
June ...	10.50	10.39	12.25	9.88	6.75	5.12	7.88	7.00
July ...	10.63	10.00	12.40	8.90	7.25	4.50	9.25	7.00
Aug. ...	11.00	10.75	12.75	8.50	7.56	5.30	9.95	7.00
Sept. ...	11.00	12.13	12.25	8.65	7.20	6.00	8.88	6.75
Oct. ...	11.00	12.50	12.25	8.00	7.25	6.00	8.20	5.50
Nov. ...	11.00	12.13	11.63	7.75	6.94	6.00	7.75	5.25
Dec. ...	11.13	12.00	10.75	7.40	6.70	5.50	7.50	5.25
Aver. ...	11.57	11.22	12.20	9.49	7.29	5.89	7.42	7.02

No. 1 Cast Cupola Scrap

	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan.	\$24.20	\$32.00	\$25.00	\$16.30	\$23.30	\$21.00	\$19.63	\$17.50	\$16.00	\$14.50	\$16.00	\$14.00	\$12.00	\$9.50	\$8.60	\$11.40
Feb.	18.75	34.00	22.75	16.00	24.75	21.38	20.13	17.00	15.56	14.50	15.00	14.00	12.00	9.50	8.50	12.25
March	18.00	34.00	21.20	15.94	26.75	20.25	18.60	17.00	15.80	14.50	15.13	14.00	12.00	9.20	8.50	13.50
April	19.00	33.00	18.00	16.88	27.75	18.50	17.75	16.50	16.00	14.50	14.39	14.00	12.00	9.00	8.75	13.50
May	17.20	32.00	18.00	18.50	26.30	17.88	17.50	16.50	15.70	14.50	15.50	14.00	10.75	8.90	9.90	12.80
June	18.50	32.00	16.63	18.75	24.13	17.25	17.10	15.90	15.13	14.25	15.50	14.00	10.00	8.50	10.00	12.00
July	20.40	40.20	16.00	19.00	21.10	17.80	17.00	15.75	15.00	14.25	15.50	13.00	10.00	8.87	10.63	12.00
Aug.	23.50	41.25	16.20	19.00	21.38	18.00	17.50	16.80	15.00	14.50	15.50	13.00	10.50	9.00	11.50	11.75
Sept.	23.50	42.00	16.88	22.13	21.75	18.00	17.40	16.50	15.00	14.94	15.50	13.00	10.10	9.50	11.50	11.50
Oct.	23.80	39.75	17.50	24.00	19.50	18.00	17.39	16.00	14.75	15.40	15.50	12.88	9.50	9.50	11.50	11.00
Nov.	27.25	34.25	17.10	23.13	18.63	18.13	18.00	16.30	14.35	15.00	15.13	12.13	9.50	9.10	11.00	11.19
Dec.	28.75	27.25	16.13	22.38	20.00	19.10	17.70	16.00	14.38	14.80	14.50	12.00	9.50	9.00	11.00	12.25
Aver.	21.90	35.14	18.45	19.33	22.95	18.77	17.98	16.48	15.22	14.64	15.34	13.33	10.65	9.18	10.12	12.09

Scrap Prices at Chicago, Gross Ton

No. 1 Heavy Melting Steel

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan. ...	\$30.00	\$17.40	\$24.50	\$15.13	\$11.45	\$19.15	\$17.69	\$19.44	\$15.12	\$13.25	\$12.50	\$15.39	\$12.75	\$10.27	\$7.50	\$5.25	\$10.50
Feb. ...	30.25	15.06	25.00	15.13	11.38	20.33	17.88	17.69	13.88	13.00	12.69	15.88	13.31	10.06	7.25	5.25	11.00
March ...	29.87	15.63	24.25	12.50	12.38	23.50	16.56	16.45	13.95	12.90	12.63	15.66	13.19	10.00	7.25	5.25	12.13
April ...	28.75	16.41	23.75	11.00	13.75	22.50	14.10	14.81	13.19	13.13	12.63	15.95	13.00	9.81	7.14	6.00	11.75
May ...	28.80	15.62	23.00	11.50	14.95	19.70	13.75	15.00	12.13	12.35	12.95	15.39	12.50	8.88	6.45	8.45	11.05
June ...	29.00	16.69	22.95	10.81	14.56	17.88	13.63	15.75	12.45	12.00	12.63	14.94	12.06	8.75	5.69	8.91	9.75
July ...	29.00	19.40	24.13	10.00	15.25	17.05	14.90	15.60	14.19	12.06	12.30	14.75	12.00	8.75	4.88	10.42	9.55
Aug. ...	29.00	20.88	25.35	10.60	15.95	16.00	15.50	16.44	14.00	12.30	12.75	15.06	12.13	8.38	5.75	10.46	9.19
Sept. ...	29.00	19.10	24.81	11.31	18.13	16.31	16.40	16.35	14.00	12.25	12.94	15.13	12.50	8.20	6.25	9.84	8.50
Oct. ...	29.00	18.25	21.50	12.44	18.40	14.15	16.13	16.00	13.00	11.69	13.95	14.30	11.38	8.00	6.00	9.47	8.75
Nov. ...	28.50	20.88	18.45	12.25	17.31	14.00	17.13	16.00	13.00	11.50	14.50	13.15	10.13	8.00	5.93	8.60	9.25
Dec. ...	22.75	21.80	16.20	11.13	17.25	16.06	18.95	15.75	13.00	12.06	14.55	12.50	10.00	7.80	5.25	8.94	10.40
Aver. ...	28.66	18.09	22.82	11.98	15.06	18.05	16.05	16.27	13.49	12.39	13.09	14.84	12.08	8.91	6.28	8.07	10.15

Steel Rolling Rails

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan. ...	\$35.00	\$22.10	\$34.25	\$15.63	\$12.10	\$20.40	\$18.88	\$21.75	\$17.50	\$16.38	\$14.90	\$17.00	\$14.63	\$12.50	\$10.50	\$7.50	\$11.30
Feb. ...	35.00	16.44	34.38	15.50	12.00	21.75	20.13	19.25	16.63	15.94	15.00	17.50	15.00	12.00	10.50	7.50	11.81
March ...	34.75	16.38	32.30	13.30	13.31	24.63	19.13	17.86	16.50	15.60	14.44	17.50	15.00	12.00	9.85	7.50	12.62
April ...	33.50	17.55	32.13	12.63	14.50	23.75	16.30	16.00	16.13	16.00	13.81	17.50	15.00	11.75	9.00	7.88	12.50
May ...	34.00	17.75	31.75	13.40	15.70	21.70	15.00	16.88	15.19	15.20	14.40	17.50	14.81	10.69	8.30	9.30	11.90
June ...	34.00	18.75	32.65	12.94	15.25	19.25	14.81	17.85	15.45	14.75	14.81	17.50	14.63	8.40	7.31	9.63	10.50
July ...	34.00	25.15	35.00	12.25	16.13	18.00	15.50	17.44	17.19	14.88	14.75	17.50	14.50	10.39	6.63	11.32	10.35
Aug. ...	34.00	29.50	38.00	12.45	16.90	17.50	16.19	19.00	17.10	15.30	15.13	17.75	14.50	10.13	6.75	12.00	10.00
Sept. ...	34.00	26.80	38.13	13.13	19.38	17.38	17.30	19.25	17.39	15.19	15.88	17.81	14.40	10.00	7.19	11.38	10.00
Oct. ...	34.00	27.19	33.44	14.00	20.30	15.80	17.06	18.88	16.63	14.88	16.50	17.20	13.88	10.00	8.00	10.88	10.00
Nov. ...	33.50	31.25	22.90	13.80	18.38	15.06	18.19	19.44	16.50	14.50	16.63	15.50	12.50	10.25	8.00	9.90	10.06
Dec. ...	27.50	31.90	16.90	12.63	17.75	17.00	20.36	19.10	16.19	14.63	16.60	14.60	12.50	10.50	7.50	10.00	10.75
Aver. ...	33.60	23.40	31.90	13.47	15.98	19.35	17.40	18.56	16.53	15.27	15.24	17.07	14.28	10.72	8.29	9.57	10.98

Cast Iron Borings

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan. ...	\$18.48	\$12.54	\$16.11	\$10.92	\$6.38	\$15.57	\$13.58	\$15.56	\$13.39	\$10.06	\$10.40	\$12.50	\$9.56	\$5.06	\$3.38	\$3.00	\$6.30
Feb. ...	18.48	8.75	16.39	11.76	6.93	16.59	15.55	14.63	12.06	10.13	10.13	12.00	10.13	4.75	4.25	3.19	6.56
March ...	18.48	10.15	15.74	8.40	8.05	18.91	14.38	13.85	11.75	10.20	9.63	10.63	9.56	4.75	4.20	3.25	7.44
April ...	17.99	10.47	15.96	7.28	9.24	17.92	11.40	10.94	10.94	10.44	9.31	10.40	9.25	4.50	3.75	3.88	7.25
May ...	17.53	9.31	14.43	6.61	10.98	16.24	10.00	10.00	9.75	10.00	9.25	10.19	8.81	3.75	3.25	5.00	6.45
June ...	17.77	9.33	13.38	5.60	11.63	14.43	10.06	10.70	9.95	9.56	9.00	9.88	8.00	3.75	2.63	5.25	5.00
July ...	18.48	12.71	14.15	5.32	12.67	13.66	10.45	11.13	11.19	9.94	9.05	9.75	7.90	3.75	2.00	6.25	4.90
Aug. ...	18.48	14.28	15.06	5.38	12.88	12.04	10.69	12.75	11.45	10.50	9.31	10.19	7.75	3.94	3.05	6.50	5.00
Sept. ...	18.48	13.55	14.65	5.60	14.43	12.19	11.80	13.15	11.19	10.75	9.75	10.50	7.35	4.10	3.88	6.25	4.88
Oct. ...	18.48	11.63	12.88	6.44	14.90	10.42	11.56	12.75	8.88	10.13	10.75	10.00	5.75	4.00	3.88	5.88	4.50
Nov. ...	16.80	12.88	11.93	6.83	14.56	10.08	12.63	13.19	9.20	9.60	11.69	9.25	4.13	4.00	3.65	5.15	4.81
Dec. ...	14.84	14.17	10.98	6.09	14.56	12.04	14.36	13.50	9.50	10.19	11.85	9.15	4.90	3.60	3.06	5.50	5.95
Aver. ...	17.94	11.65	14.30	7.19	11.43	14.17	12.21	12.68	10.77	10.13	10.01	10.37	7.76	4.16	3.41	4.93	5.75

Steel Knuckles and Couplers

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan. ...	\$37.52	\$24.51	\$27.44	\$16.39	\$12.77	\$24.98	\$21.21	\$22.88	\$18.00	\$16.25	\$14.65	\$16.50	\$16.00	\$12.00	\$8.25	\$7.00	\$11.10
Feb. ...	36.89	19.32	29.68	16.11	12.39	26.53	21.77	21.00	17.13	16.00	14.50	17.00	16.00	12.00	8.25	7.00	11.69
March ...	35.00	19.60	27.66	13.55	14.12	28.71	20.00	18.70	16.70	15.60	14.06	17.00	15.88	11.80	7.95	7.00	12.62
April ...	34.00	19.21	26.32	12.47	15.68	27.93	17.40	17.63	16.44	15.69	13.81	17.30	15.25	10.56	7.63	6.75	12.25
May ...	34.00	17.36	25.48	13.66	16.69	25.42	17.00	17.63	15.39	14.80	14.50	17.13	14.31	9.75	6.70	9.40	11.45
June ...	34.00	18.20	25.20	13.16	15.89	22.55	16.63	19.00	15.30	14.25	14.25	16.75	13.75	9.75	5.63	9.50	10.00
July ...	34.00	20.50	27.16	11.63	17.92	21.00	17.20	18.19	17.39	14.25	13.75	16.75	13.50	9.75	5.50	10.63	9.90
Aug. ...	34.00	23.52	29.01	12.21	19.21	20.87	18.00	19.50	17.50	14.40	14.00	16.94	13.50	9.32	6.30	11.00	10.00
Sept. ...	34.00	21.95	27.72	13.03	21.84	21.56	19.35	19.50	17.39	14.00	14.75	17.00	13.50	9.00	7.00	10.75	9.88
Oct. ...	34.00	21.43	24.51	14.84	22.96	18.93	18.25	18.63	16.06	13.25	15.75	17.00	13.00	8.70	7.00	10.13	10.00
Nov. ...	34.00	23.39	20.83	14.28	21.84	17.64	19.63	18.75	15.50	13.00	16.00	16.39	12.13	8.50	7.00	9.30	10.50
Dec. ...	32.55	24.86	16.95	12.60	22.12	19.88	22.78	18.25	15.50	13.69	16.00	16.00	12.00	8.45	7.00	9.63	11.40
Aver. ...	34.50	21.15	25.67	13.66	17.79	23.00	19.10	19.14	16.53	14.60	14.67	16.81	14.07	9.97	7.02	9.01	10.90

Railroad Malleable Scrap

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan. . . .	\$30.02	\$19.71	\$32.48	\$16.52	\$12.77	\$25.26	\$20.93	\$21.13	\$18.00	\$16.06	\$13.60	\$18.69	\$16.39	\$12.75	\$7.00	\$5.50	\$11.10
Feb. . . .	30.02	16.65	33.53	17.36	12.81	26.75	21.77	20.00	17.56	16.06	13.50	19.39	17.13	11.94	7.00	5.50	11.75
March . . .	31.24	18.07	31.92	15.46	13.87	28.56	21.00	19.10	17.60	16.00	12.63	19.39	16.88	11.70	6.65	5.63	12.25
April . . .	31.64	17.70	30.95	13.59	15.68	28.00	19.30	17.50	17.39	15.88	12.75	19.35	16.55	11.13	6.38	6.75	12.00
May	32.82	17.08	29.68	14.11	16.80	25.54	18.13	17.63	16.50	14.45	13.00	18.56	15.75	10.25	6.00	9.35	11.30
June	33.04	17.92	28.73	12.88	16.73	24.08	16.88	18.00	16.60	13.50	12.69	17.81	13.94	9.55	5.19	9.75	9.75
July	33.28	20.94	30.24	12.53	17.51	22.51	17.00	17.88	17.81	13.63	12.50	16.85	13.50	9.00	4.63	10.25	9.55
Aug.	34.01	22.96	32.20	13.44	19.04	20.59	17.38	19.13	17.75	14.50	12.88	16.94	13.50	8.43	5.10	10.50	9.38
Sept.	34.01	21.22	30.95	14.63	23.67	21.71	18.20	19.10	17.39	13.69	14.39	17.00	13.50	7.50	6.75	9.75	8.75
Oct.	34.01	21.35	26.32	15.12	24.42	19.60	18.13	18.50	16.50	13.13	15.30	17.00	13.13	7.40	6.38	9.38	9.00
Nov.	32.68	25.89	21.78	14.67	23.11	18.91	19.00	19.19	16.50	12.55	15.88	16.39	12.69	7.25	5.50	8.70	9.13
Dec.	25.48	28.78	16.80	12.81	22.40	20.23	20.28	18.30	16.00	12.81	17.00	16.10	12.25	7.00	5.50	9.75	10.90
Aver. . . .	31.85	20.85	28.80	13.43	18.23	23.48	19.00	18.79	17.13	14.36	13.85	17.79	14.66	9.49	6.01	9.40	10.44

No. 1 Railroad Wrought, Net Ton

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan. ...	\$31.25	\$19.10	\$26.00	\$13.63	\$10.50	\$17.75	\$15.31	\$17.44	\$13.50	\$12.50	\$11.10	\$13.63	\$12.00	\$8.50	\$6.00	\$4.40	\$9.00
Feb. ...	31.25	15.13	27.00	13.50	10.44	18.38	15.38	16.13	12.88	12.31	11.13	14.25	12.19	8.00	5.50	4.50	9.31
March ...	30.75	15.88	27.10	11.60	11.50	20.88	14.06	14.60	12.95	12.10	11.00	14.00	12.25	8.10	5.50	4.50	9.50
April ...	30.20	16.05	27.25	10.00	12.13	20.00	12.75	13.00	12.44	12.39	11.25	14.15	11.95	8.19	5.44	4.88	9.50
May ...	29.75	15.69	26.38	10.40	12.90	17.60	12.00	13.44	10.94	11.35	11.60	14.13	11.13	7.50	4.15	6.30	8.80
June ...	29.75	16.87	25.25	9.63	12.69	15.50	11.56	14.65	11.60	11.00	11.31	13.63	10.25	7.20	3.75	7.25	7.50
July ...	29.75	18.60	24.88	9.25	13.63	14.60	12.80	14.19	13.31	11.39	10.85	13.50	9.90	7.00	3.75	8.50	7.35
Aug. ...	29.75	20.75	24.75	10.45	14.75	14.25	13.75	16.00	13.50	11.70	11.06	13.88	9.75	7.00	4.20	9.00	7.43
Sept. ...	29.75	19.50	23.88	11.50	17.62	15.63	14.80	15.50	13.50	11.25	11.81	14.00	9.75	6.95	5.13	8.69	6.88
Oct. ...	30.36	19.38	20.25	13.00	17.75	13.20	14.25	14.38	12.81	10.19	12.60	13.70	9.19	6.75	4.63	8.12	7.00
Nov. ...	28.68	22.88	16.85	12.20	15.81	12.50	15.50	15.63	12.50	9.60	13.13	12.44	8.63	6.50	4.50	7.25	8.38
Dec. ...	24.62	24.10	14.60	10.44	15.13	15.00	16.81	13.95	12.00	10.44	13.25	12.00	8.50	6.50	4.12	7.69	9.45
Aver. ...	29.66	18.66	23.68	11.50	13.74	16.27	14.08	14.91	12.66	11.35	11.67	13.30	10.46	7.35	4.72	6.76	8.34

No. 1 Machinery Cast Scrap, Net Ton

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan. ...	\$25.90	\$22.95	\$37.25	\$17.25	\$12.90	\$21.60	\$20.38	\$19.88	\$17.00	\$16.50	\$14.50	\$15.81	\$13.50	\$9.50	\$7.75	\$6.25	\$9.50
Feb. ...	26.06	20.00	38.88	18.00	13.25	23.63	21.00	18.75	17.00	16.50	14.50	16.25	13.75	9.50	7.50	6.25	9.50
March ...	27.25	21.63	37.85	14.90	14.13	26.25	20.13	18.20	17.00	16.50	14.50	16.00	13.75	9.50	7.20	6.25	9.50
April ...	27.12	21.45	37.25	13.25	14.88	25.75	18.40	17.25	16.39	16.50	14.13	16.00	13.50	9.39	7.00	7.06	9.50
May ...	26.70	20.12	37.38	13.60	16.20	23.30	17.38	16.88	15.88	15.80	14.00	15.39	12.88	9.00	6.50	8.45	8.90
June ...	27.12	20.75	36.30	12.75	16.06	21.75	16.75	17.50	16.15	14.50	13.88	14.75	12.50	9.00	6.13	8.75	7.50
July ...	28.06	23.30	36.50	12.25	17.00	19.60	16.90	17.50	17.19	14.50	13.50	14.50	12.00	9.00	6.00	10.63	8.05
Aug. ...	29.10	24.50	36.20	12.60	18.60	18.00	17.50	17.63	17.00	14.80	13.94	14.50	12.00	9.00	6.10	10.50	8.00
Sept. ...	30.00	24.20	34.00	13.44	21.38	19.63	18.20	17.90	16.88	14.56	14.81	14.50	11.40	8.50	6.25	10.00	8.00
Oct. ...	30.36	25.00	28.75	13.88	20.80	18.70	17.50	17.63	16.50	14.25	15.40	14.50	10.63	8.50	6.25	9.88	8.00
Nov. ...	28.87	28.12	23.00	13.50	20.25	18.38	17.88	18.19	16.00	13.50	15.50	13.63	9.36	8.50	6.25	8.60	8.25
Dec. ...	25.75	32.35	18.70	12.63	19.75	19.75	19.20	17.25	16.13	14.00	15.60	13.50	9.50	8.50	6.25	8.75	9.60
Aver. ...	27.69	23.70	33.51	14.00	17.10	21.36	18.44	17.88	16.59	15.16	14.39	15.11	11.75	8.95	6.60	8.45	8.69

Eastern Pennsylvania Scrap Prices, Gross Ton

No. 1 Heavy Melting Steel

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan. ...	\$30.00	\$17.20	\$24.75	\$14.50	\$11.60	\$19.70	\$18.20	\$18.50	\$17.00	\$15.39	\$13.50	\$16.39	\$14.50	\$10.50	\$7.00	\$6.75	\$11.70
Feb. ...	30.00	14.75	25.62	14.25	12.00	20.75	18.38	17.63	15.88	14.63	13.50	16.39	14.63	10.50	7.00	6.75	11.75
March ...	29.00	14.19	25.20	13.00	12.78	25.25	16.75	15.90	16.00	14.50	13.50	16.13	14.88	10.50	7.00	6.75	11.88
April ...	28.00	15.50	24.12	11.25	14.00	23.63	15.30	14.63	16.00	14.50	13.50	17.00	13.95	10.31	7.50	7.19	11.69
May ...	29.00	15.00	23.37	11.80	14.75	19.80	14.75	14.63	15.25	14.10	13.50	16.39	13.39	9.69	6.00	8.90	10.95
June ...	29.00	16.12	22.60	11.25	15.00	17.88	15.00	15.10	14.70	14.00	13.39	16.00	12.75	9.10	6.00	9.25	10.50
July ...	29.00	18.90	22.62	11.00	15.00	16.60	15.40	15.63	14.63	13.39	13.00	16.50	12.50	8.44	6.00	10.68	10.30
Aug. ...	29.00	19.37	25.00	11.40	15.20	16.00	16.75	16.38	16.20	13.70	13.00	16.50	12.63	8.69	6.30	11.95	9.94
Sept. ...	29.00	18.62	25.62	11.50	16.88	16.75	17.10	17.20	16.88	14.00	14.75	16.39	13.00	8.50	7.25	11.25	9.63
Oct. ...	29.00	19.10	22.75	12.06	17.80	15.40	16.63	16.75	16.50	14.00	16.00	15.70	12.38	8.13	7.25	10.20	9.53
Nov. ...	28.00	20.62	19.00	11.88	16.25	15.25	17.75	17.38	15.50	13.80	15.50	15.00	11.75	8.00	7.25	9.75	9.94
Dec. ...	25.00	22.50	15.25	11.50	16.38	16.75	20.10	17.50	15.50	13.50	15.40	14.50	11.10	7.75	6.75	10.44	10.75
Aver. ...	28.67	17.66	22.99	12.12	14.80	18.65	16.84	16.44	15.84	14.13	14.05	16.07	13.12	9.18	6.77	9.16	10.71

No. 1 Machinery Cast

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan. ...	\$30.00	\$23.80	\$36.00	\$23.25	\$16.50	\$23.20	\$20.70	\$20.13	\$18.39	\$17.00	\$16.00	\$16.31	\$15.00	\$12.00	\$10.00	\$8.00	\$12.00
Feb. ...	30.00	23.00	40.00	23.00	16.50	24.25	20.25	18.88	17.75	17.00	16.00	16.50	15.00	11.90	10.00	8.00	12.00
March ...	30.00	21.25	39.20	19.40	17.13	28.25	18.63	18.00	17.50	17.00	16.00	16.50	15.00	11.50	9.90	8.00	12.75
April ...	29.00	22.00	38.00	18.00	17.25	26.25	17.70	17.25	17.50	17.00	16.00	16.50	14.85	11.50	9.75	8.50	12.88
May ...	29.00	21.50	37.75	18.00	18.40	24.30	17.00	17.00	17.25	16.80	16.00	16.50	14.00	11.50	8.12	10.25	12.10
June ...	29.00	22.00	37.00	17.38	19.00	22.25	17.50	17.50	17.00	16.00	16.00	16.00	13.50	11.20	8.00	10.25	12.00
July ...	29.00	22.10	37.50	16.50	17.50	20.40	17.50	17.63	17.00	16.00	15.50	16.50	13.00	11.00	6.50	11.81	11.60
Aug. ...	29.00	24.75	39.00	17.00	18.60	20.38	17.88	18.00	17.70	16.00	15.50	16.50	13.00	11.00	8.20	12.50	11.50
Sept. ...	29.00	25.00	39.25	17.00	21.50	21.38	18.00	18.00	18.00	16.38	16.25	16.88	13.00	11.00	9.25	12.50	11.50
Oct. ...	29.00	25.20	38.75	17.13	22.60	19.50	17.50	18.00	17.39	16.50	17.10	16.00	13.00	11.00	9.50	11.50	11.10
Nov. ...	29.00	27.62	33.80	17.50	21.00	19.25	17.88	18.00	17.30	16.13	16.39	15.88	12.00	11.00	9.31	11.25	10.50
Dec. ...	29.00	30.75	24.50	16.63	20.25	20.25	19.50	18.13	17.00	16.00	16.25	15.00	12.00	10.10	8.00	11.81	10.50
Aver. ...	29.25	24.08	36.73	18.49	18.85	22.47	18.34	18.04	17.48	16.48	16.08	16.28	13.61	11.23	8.88	10.36	11.70

No. 1 Railroad Wrought

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan. ...	\$35.00	\$24.20	\$33.50	\$20.00	\$14.50	\$22.10	\$20.90	\$20.88	\$18.39	\$17.00	\$15.25	\$15.50	\$15.00	\$13.13	\$9.00	\$7.50	\$11.00
Feb. ...	35.00	21.50	36.00	19.75	14.63	24.75	21.50	20.13	17.75	17.00	15.06	16.00	15.00	12.00	8.50	7.50	11.00
March ...	35.00	20.25	35.90	17.20	15.38	27.50	19.00	18.90	17.20	17.00	14.60	16.00	15.00	12.00	8.50	7.50	11.00
April ...	35.00	21.60	35.00	17.00	15.88	27.00	18.10	17.75	17.50	16.50	14.50	16.00	15.00	11.25	9.00	7.62	11.50
May ...	34.00	21.00	33.50	15.20	16.90	24.20	16.63	17.50	17.25	16.50	14.50	16.00	15.00	11.00	7.19	10.75	12.00
June ...	34.00	21.50	33.00	14.38	17.00	22.50	16.50	18.10	16.60	16.00	13.75	16.00	15.00	10.20	7.00	10.75	12.00
July ...	34.00	24.40	33.00	13.50	17.13	18.80	17.70	17.63	16.50	15.75	13.50	16.00	15.00	10.00	7.00	11.06	11.20
Aug. ...	34.00	26.50	33.00	14.00	18.00	18.00	18.63	17.50	17.80	15.50	13.50	16.00	15.00	10.00	7.00	12.00	11.00
Sept. ...	34.00	26.50	33.25	15.00	20.88	18.50	19.00	17.70	17.88	15.50	14.50	16.00	15.00	10.00	7.50	12.00	11.00
Oct. ...	34.00	26.90	29.25	15.88	22.20	17.50	18.00	18.13	17.00	15.50	15.60	16.00	14.75	10.00	7.50	11.20	11.00
Nov. ...	34.00	28.37	25.00	16.00	19.00	17.38	18.38	18.50	17.00	15.30	16.00	15.88	13.75	10.00	7.50	11.00	11.00
Dec. ...	33.00	30.25	20.00	14.63	19.25	18.50	20.40	18.50	17.00	15.25	16.00	15.40	13.50	9.50	7.50	11.00	11.00
Aver. ...	34.25	24.41	31.70	16.04	17.56	21.89	18.73	18.44	17.32	16.07	14.73	15.90	14.75	10.75	8.60	9.99	11.22

Non-Ferrous Metals

Copper at New York, Cents a Pound (Lake Copper through 1919; Electrolytic Copper, 1920 to Date)

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan. . . .	23.50	20.48	19.27	12.95	13.55	14.52	12.46	14.73	13.84	12.99	13.85	16.59	17.75	9.79	7.12	4.75	7.92
Feb. . . .	23.50	17.86	19.02	12.84	12.92	15.34	12.73	14.49	14.00	12.69	13.82	17.74	17.75	9.71	6.07	4.75	7.75
March . . .	23.50	15.46	18.50	12.19	12.68	16.84	13.52	14.06	13.86	13.08	13.90	21.25	17.75	9.88	5.76	5.00	7.75
April . . .	23.50	15.55	19.19	12.49	12.61	16.81	13.21	13.30	13.69	12.81	14.13	19.69	15.67	9.48	5.54	5.39	8.16
May	23.50	16.18	19.05	12.79	13.13	15.54	12.76	13.34	13.60	12.65	14.19	17.75	12.76	8.67	5.25	6.68	8.25
June	23.50	17.95	19.00	12.88	13.62	14.74	12.35	13.41	13.64	12.37	14.50	17.75	12.09	8.05	5.11	7.75	8.57
July	25.80	22.07	19.00	12.46	13.71	14.39	12.39	13.95	13.91	12.51	14.50	17.75	11.02	7.67	5.04	8.63	8.75
Aug.	26.00	23.16	19.00	11.70	13.74	13.87	13.26	14.48	14.19	13.00	14.50	17.75	10.65	7.26	5.15	8.75	8.75
Sept.	26.00	22.68	18.70	12.01	13.75	13.36	12.97	14.42	14.05	12.93	14.70	17.75	10.39	6.98	5.95	8.75	8.75
Oct.	26.00	22.13	16.56	12.67	13.66	12.58	12.96	14.29	13.88	12.98	15.16	17.75	9.60	6.75	5.72	7.97	8.75
Nov.	26.00	20.69	13.62	13.07	13.62	12.76	13.59	14.36	13.59	13.34	15.75	17.75	10.17	6.54	5.07	7.91	8.75
Dec.	25.40	18.90	13.62	13.55	14.00	12.88	14.23	13.82	13.31	13.79	15.84	17.75	10.29	6.60	4.78	7.87	8.75
Aver. . . .	24.68	19.43	17.96	12.63	13.42	14.47	13.04	14.05	13.80	12.93	14.57	18.11	12.99	8.11	5.55	7.02	8.41

Spelter (Zinc) at New York, Cents a Pound

	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan.	6.59	18.19	9.94	7.88	7.38	9.62	5.83	5.06	7.28	6.78	8.10	8.75	7.03	6.00	6.70	5.59	4.37	3.38	3.38	4.62
Feb.	8.84	20.13	10.48	7.99	6.70	9.14	5.36	4.85	7.58	7.11	7.86	8.16	7.04	5.90	6.70	4.53	4.36	3.19	3.04	4.73
March	9.29	18.40	10.77	7.64	6.52	8.93	5.20	5.00	8.19	6.85	7.68	7.69	7.06	5.98	6.80	5.30	4.30	3.16	3.37	4.72
April	11.22	18.59	9.85	7.01	6.51	8.63	5.24	5.25	7.65	6.49	7.35	7.36	6.69	6.11	7.04	5.19	4.06	3.10	3.68	4.72
May	16.14	15.86	9.46	7.32	6.46	8.08	5.28	5.45	6.99	6.13	7.30	7.16	6.43	6.37	6.98	4.98	3.66	2.90	4.17	4.71
June	22.18	12.75	9.62	8.01	6.93	7.92	4.95	5.69	6.40	6.14	7.35	7.47	6.57	6.50	7.00	4.79	3.75	3.16	4.70	4.59
July	20.58	9.83	8.95	8.69	7.90	8.18	4.77	6.12	6.43	6.25	7.60	7.76	6.58	6.55	7.10	4.66	4.25	2.92	5.24	4.68
Aug.	14.11	8.98	8.69	8.96	7.84	8.31	4.69	6.59	6.68	6.53	7.55	7.69	6.70	6.59	7.15	4.72	4.17	3.13	5.28	4.63
Sept.	14.16	8.22	8.34	9.60	7.57	7.82	4.74	6.91	6.81	6.54	8.12	7.76	6.56	6.60	7.15	4.62	4.09	3.68	5.08	4.43
Oct.	13.96	9.98	8.24	9.11	7.83	7.51	5.10	7.20	6.66	6.67	8.65	7.66	6.35	6.60	7.09	4.40	3.73	3.41	5.12	4.19
Nov.	17.15	11.90	7.95	8.70	8.14	6.84	5.18	7.48	6.70	7.14	9.04	7.56	6.09	6.62	6.63	4.63	3.55	3.46	4.87	4.08
Dec.	16.69	11.13	7.84	8.45	8.59	6.00	5.25	7.46	6.60	7.73	8.97	7.39	6.15	6.70	6.09	4.43	3.50	3.50	4.82	4.06
Aver. . . .	14.24	13.66	9.18	8.28	7.36	8.08	5.13	6.09	7.00	6.70	7.96	7.70	6.60	6.39	6.87	4.82	3.98	3.25	4.40	4.51

Lead, at New York, Cents a Pound

	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan.	3.74	5.93	7.69	6.87	5.56	8.67	5.00	4.70	7.85	8.31	10.26	9.25	7.59	6.50	6.65	6.25	4.80	3.75	3.00	4.00
Feb.	3.82	6.23	9.13	7.04	5.05	8.88	4.54	4.70	8.14	9.01	9.38	9.08	7.40	6.34	6.85	6.24	4.55	3.72	3.00	4.00
March	4.04	7.43	9.47	7.24	5.23	9.21	4.08	4.71	8.47	9.23	8.90	8.46	7.57	6.00	7.41	5.66	4.53	3.15	3.15	4.00
April	4.20	7.73	9.43	6.95	5.03	8.95	4.33	5.13	8.19	8.19	8.01	7.91	7.10	6.40	7.19	5.58	4.42	3.00	3.27	4.18
May	4.25	7.45	11.00	6.88	5.05	8.55	4.99	5.51	7.39	7.27	8.08	7.75	6.60	6.13	7.00	5.51	3.82	3.00	3.65	4.14
June	5.89	6.87	11.68	7.55	5.34	8.48	4.56	5.73	7.14	7.08	8.35	8.08	6.42	6.30	7.00	5.41	3.92	2.99	4.17	3.98
July	5.59	6.34	10.72	8.04	5.65	8.67	4.40	5.75	6.28	7.15	8.33	8.60	6.33	6.22	6.80	5.25	4.40	2.73	4.46	3.77
Aug.	4.68	6.26	10.72	8.05	5.77	8.98	4.40	5.88	6.74	8.02	9.52	8.96	6.69	6.25	6.75	5.49	4.40	3.24	4.50	3.75
Sept.	4.62	6.88	8.84	8.05	6.12	8.11	4.60	6.20	7.06	8.09	9.60	8.80	6.30	6.45	6.88	5.50	4.40	3.47	4.50	3.68
Oct.	4.60	7.00	6.77	8.05	6.45	7.24	4.70	6.67	6.84	8.31	9.62	8.40	6.25	6.50	6.87	5.17	3.97	3.05	4.32	3.65
Nov.	5.16	7.13	6.44	8.05	6.76	6.32	4.70	7.20	6.87	8.96	9.84	8.00	6.27	6.39	6.29	5.10	3.94	3.04	4.29	3.57
Dec.	5.33	7.60	6.48	6.71	7.03	4.80	4.70	7.28	7.61	9.61	9.36	7.87	6.52	6.49	6.25	5.10	3.80	3.00	4.14	3.60
Aver. . . .	4.66	6.90	9.03	7.46	5.76	8.07	4.58	5.79	7.39	8.27	9.10	8.39	6.75	6.31	6.83	5.52	4.25	3.18	3.87	3.86

Straits, Tin, at New York, Cents a Pound

	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan.	85.13	71.50	62.74	35.94	32.03	39.16	48.70	58.26	62.20	66.43	55.56	49.21	38.84	26.03	21.80	22.70	51.98
Feb.	85.00	72.45	59.87	32.16	30.74	41.98	53.41	57.09	63.65	69.05	52.47	49.39	38.63	26.27	21.97	23.51	51.78
March	85.00	72.50	61.93	28.79	29.14	48.61	55.03	53.67	64.47	69.23	52.11	48.85	36.76	27.02	21.81	24.35	53.84
April	88.53	72.50	62.12	30.36	30.58	45.84	50.02	52.27	63.35	67.88	52.28	45.93	35.90	25.13	19.17	27.16	55.66
May	100.00	72.50	54.99	32.50	30.92	43.11	44.08	54.65	62.36	67.47	51.53	43.88	32.16	23.16	20.90	35.94	53.57
June	91.00	71.83	48.34	29.39	31.46	40.97	42.74	55.93	60.63	67.42	47.92	44.20	30.26	23.53	19.58	44.23	51.31
July	93.00	70.11	49.29	27.69	31.67	38.47	46.29	58.05	62.98	64.01	47.01	46.29	29.76	24.96	20.89	46.28	51.94
Aug.	91.33	62.20	47.60	26.35	32.36	39.33	41.89	58.12	65.17	64.41	47.97	46.60	30.00	25.73	22.98	44.71	51.99
Sept.	80.40	59.79	44.43	26.70	32.36	41.60	49.24	58.27	68.89	61.43	48.06	45.32	29.59	24.51	24.76	46.46	51.52
Oct.	78.82	54.82	40.47	27.70	34.61	41.80	50.60	62.24	70.36	58.49	48.99	42.25	26.76	22.72	23.91	47.95	51.01
Nov.	73.67	54.17	36.97	28.93	36.76	44.09	54.25	63.30	70.75	57.49	50.76	40.18	25.87	22.78	23.31	53.14	51.24
Dec.	71.51	53.80	34.04	32.41	37.48	47.16	56.03	62.94	68.68	58.54	50.23	39.87	25.01	21.28	22.70	52.91	50.94
Aver. . . .	85.28	65.68	50.23	29.91	32.51	42.68	50.19	57.90	64.29	64.32	50.39	45.16	31.63	24.43	21.98	39.12	52.23

Aluminum (No. 1 Virgin, 99 Per Cent Plus), at New York, Cents a Pound

	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Jan.	33.10	32.00	22.86	17.74	22.75	27.61	27.00	27.00	26.37	23.90	23.90	23.90	20.50	19.50	19.00	19.75
Feb.	32.26	31.83	24.50	17.33	23.25	27.71	27.00	27.00	25.83	23.90	23.90	23.90	20.50	19.50	19.00	19.75
March	29.81	31.50	23.44	17.52	24.95	27.57	27.00	27.00	25.55	23.90	23.90	22.90	20.00	19.00	19.00	20.00
April	30.67	31.61	23.25	18.07	26.00	27.46	27.00	27.00	25.55	23.90	23.90	20.50	19.50	18.50	19.50	20.00
May	32.21	31.95	23.06	17.92	26.24	26.43	27.00	27.00	25.55	23.90	23.90	20.50	19.50	18.00	19.50	20.50
June	32.83	32.00	22.75	17.87	26.25	26.27	27.00	27.00	25.55	23.90	23.90	20.50	19.50	18.00	19.50	21.00
July	32.57	32.00	22.62	17.87	26.25	26.37	27.00	27.00	25.55	23.90	23.90	20.50	19.50	18.00	19.50	21.00
Aug.	32.23	32.21	20.22	17.87	26.07	26.52	27.00	27.00	25.55	23.90	23.90	20.50	19.50	18.00	19.50	21.00
Sept.	32.50	31.44	19.02	18.26	25.50	27.24	27.00	27.00	25.55	23.90	23.90	20.50	19.50	18.00	19.50	21.00
Oct.	32.50	29.12	17.85	20.32	25.50	27.16	27.24	27.00	25.29	23.90	23.90	20.50	19.50	18.00	19.50	21.00
Nov.	32.50	27.80	17.50	20.87	25.80	27.00	28.00	27.00	24.30	23.90	23.90	20.50	19.50	18.00	19.50	21.00
Dec.	32.48	23.83	17.50	22.52	26.31	27.00	28.00	26.85	24.26	23.90	23.90	20.50	19.50	18.50	19.50	21.00
Aver.	32.14	30.61	21.21	18.68	25.11	27.03	27.19	26.99	25.11	23.90	23.90	21.27	19.71	18.12	19.38	20.56

Production of Iron and Steel and of Commodities Made From Them

Steel Ingots Made in the United States

(THE IRON AGE figures prior to June, 1917; American Iron and Steel Institute figures since then, with additions for electric and crucible steel)
(Thousands of Gross Tons)

	Jan.	Feb.	March	April	May	June	Half Year	July	Aug.	Sept.	Oct.	Nov.	Dec.	Second Half	Year
1899	801	718	822	796	874	862	4,873	856	932	917	950	980	951	*5,586	*10,459
1900	979	868	962	893	977	921	*6,600	798	775	685	712	698	727	4,395	9,995
1901	*1,009	968	*1,069	*1,085	*1,162	1,094	*6,388	1,136	1,159	1,079	*1,200	1,176	1,018	*6,768	*13,156
1902	*1,223	1,060	1,192	*1,256	*1,321	1,185	*7,237	1,189	1,211	1,209	1,268	1,174	1,268	*7,319	*14,556
1903	1,217	1,131	1,265	*1,322	*1,363	*1,376	*7,674	1,230	1,250	1,277	1,178	822	674	6,431	14,105
1904	759	1,020	1,239	1,325	1,263	1,100	*6,706	885	1,001	1,153	1,196	1,262	1,327	6,824	13,530
1905	*1,516	1,389	*1,710	1,624	*1,735	1,576	*9,550	1,425	1,629	1,670	*1,746	*1,770	1,673	*9,913	*19,463
1906	*1,928	1,746	*2,018	1,848	1,956	1,833	*11,329	1,739	1,794	1,757	*2,047	2,029	1,929	11,295	*22,624
1907	2,005	1,830	1,949	2,007	*2,087	1,944	*11,822	1,975	2,046	1,899	*2,124	1,654	1,039	10,737	22,559
1908	934	954	1,057	1,023	1,004	972	5,944	1,049	1,171	1,263	1,401	1,350	1,439	7,733	13,677
1909	1,623	1,575	1,722	1,622	1,700	1,801	10,943	1,899	2,030	*2,225	*2,347	*2,376	*2,379	13,256	*23,299
1910	*2,404	2,257	*2,506	2,365	2,203	2,157	*13,892	1,904	2,016	1,956	1,929	1,818	1,639	11,262	*25,154
1911	1,716	1,788	2,199	2,001	1,918	1,801	11,423	1,682	1,951	1,992	2,050	2,015	1,916	11,606	*30,229
1912	2,169	2,191	2,441	2,491	*2,648	2,461	*14,401	2,445	2,648	2,484	*2,833	2,759	2,715	*15,884	*30,285
1913	2,814	2,562	2,679	2,757	*2,841	2,532	*16,185	2,482	2,466	2,510	2,563	2,151	1,923	14,095	30,280
1914	1,907	1,881	2,287	2,285	2,039	1,930	12,329	1,907	1,944	1,895	1,799	1,470	1,476	10,491	22,820
1915	1,663	1,777	2,226	2,271	2,351	2,555	12,843	2,662	*2,887	*3,061	*3,246	*3,259	*3,326	*18,441	*31,284
1916	*3,333	3,321	*3,627	*3,356	*3,652	3,473	*20,762	3,245	3,481	3,463	*3,672	3,581	3,198	20,640	*41,402
1917	*3,743	3,093	*3,864	3,792	*4,061	3,617	*22,170	3,447	3,663	3,486	3,932	3,714	3,207	*21,449	*43,619
1918	2,641	2,725	3,128	3,791	3,939	3,696	20,520	3,732	3,696	3,832	4,017	3,668	3,586	*22,531	*43,051
1919	3,651	3,178	3,128	2,631	2,266	2,607	17,461	2,947	3,226	2,718	2,046	2,513	2,784	16,234	33,695
1920	3,624	3,402	3,917	3,132	3,423	3,539	20,937	3,328	3,562	3,561	3,581	3,133	2,779	19,944	40,881
1921	2,517	1,999	1,795	1,387	1,446	1,146	10,290	918	1,300	1,342	1,847	1,897	1,630	8,934	19,224
1922	1,893	2,071	2,814	2,902	3,219	3,128	16,027	2,953	2,629	2,818	3,410	3,430	3,301	18,541	34,568
1923	3,841	3,472	*4,067	3,964	*4,216	3,767	*23,327	3,531	3,696	3,357	3,577	3,134	2,863	20,159	43,486
1924	3,650	3,826	4,207	3,348	2,640	2,066	19,737	1,878	2,553	2,828	3,125	3,121	3,569	17,074	36,811
1925	4,193	3,752	4,194	3,584	3,455	3,205	22,383	3,084	3,421	3,490	3,889	3,903	3,971	21,758	*44,141
1926	4,132	3,785	4,469	4,106	3,928	3,734	*24,164	3,635	3,987	3,913	4,074	3,706	3,467	22,782	*46,936
1927	3,823	3,845	*4,575	4,163	4,083	3,526	24,015	3,232	3,529	3,298	3,345	3,155	3,203	19,762	43,777
1928	4,028	4,081	4,549	4,345	4,246	3,778	*25,027	3,841	4,217	4,186	*4,693	4,306	4,055	*25,298	*50,325
1929	4,545	4,372	*5,118	4,999	*5,339	4,951	*29,234	4,898	4,988	4,573	4,579	3,556	2,932	25,526	*54,850
1930	3,808	4,067	4,288	4,142	4,014	3,445	23,764	2,945	3,085	2,863	2,714	2,230	1,995	15,831	39,595
1931	2,534	2,570	3,083	2,794	2,574	2,149	15,704	1,907	1,733	1,560	1,605	1,607	1,313	9,725	25,429
1932	1,500	1,496	1,448	1,273	1,137	923	7,777	815	856	1,003	1,099	1,043	871	5,687	13,464
1933	1,030	1,087	910	1,361	2,005	2,599	8,992	3,210	2,905	2,313	2,112	1,540	1,822	13,902	22,894
1934	1,971	2,182	2,761	2,898	3,353	3,016	16,180	1,473	1,363	1,252	1,462	1,589	*1,956	19,095	*25,275

Asterisks denote high records. Figures for 1934 are preliminary and do not include electric and crucible ingots.
†With December estimated.

Daily Production of Steel Ingots in the United States, Gross Tons

	Jan.	Feb.	March	April	May	June	First Half	July	Aug.	Sept.	Oct.	Nov.	Dec.	Second Half	Year
1899	30,791	29,899	30,442	31,843	*32,376	*33,169	31,439	*34,246	*34,531	*35,254	*36,557	*37,680	*38,031	*36,039	*33,739
1900	36,244	36,173	35,648	35,732	36,180	35,422	35,899	31,929	28,719	27,394	26,384	26,831	29,071	28,356	32,139
1901	37,364	40,342	41,126	41,746	*43,051	*43,759	*41,213	43,702	42,939	43,174	*44,427	*45,235	40,699	*43,384	*42,303
1902	*45,284	44,164	*45,834	*48,321	*48,939	47,419	*46,693	45,735	46,569	46,497	46,974	46,961	48,760	*46,916	*46,805
1903	45,066	47,111	48,668	*50,857	*52,436	*52,906	49,510	47,313	48,075	49,128	43,624	32,872	25,909	41,222	45,353
1904	29,186	40,817	45,863	50,973	48,567	42,309	42,985	35,416	37,057	44,339	45,985	48,542	51,064	43,744	43,364
1905	*58,298	57,860	*63,349	*64,980	64,248	60,624	*61,614	56,993	60,320	64,142	*67,174	*68,077	66,931	*63,954	*62,784
1906	*71,406	*72,758	*74,746	73,942	72,439	70,500	*72,626	69,491	66,501	70,295	*75,823	*78,023	77,151	*72,869	*72,747
1907	74,265	76,239	74,967	77,216	77,293	77,749	*76,272	75,950	75,774	75,971	*78,689	63,607	41,559	68,828	72,539
1908	34,617	38,153	40,675	39,342	38,605	37,375	38,105	40,342	45,034	48,561	51,903	53,997	57,654	49,568	43,839
1909	62,412	65,630	63,753	62,387	65,390	69,273	64,791	73,031	78,084	*85,576	*90,256	*91,398	*91,511	*84,976	*74,916
1910	*92,462	*94,024	92,804	90,097	84,720	82,977	*89,624	76,152	74,678	75,242	74,191	69,946	63,015	72,195	*80,881
1911	65,991	74,524	81,441	80,042	71,023	69,285	73,698	67,257	72,268	76,632	78,851	77,498	76,642	74,880	74,289
1912	80,320	87,650	93,879	*95,803	*98,066	*98,439	*92,310	94,057	98,060	*99,369	*104,927	*106,107	*108,610	*101,823	*97,066
1913	104,218	106,757	103,034	106,052	105,220	101,268	*104,419	95,468	94,839	96,543	94,927	86,051	73,954	90,362	*97,364
1914	70,630	78,348	87,972	87,887	78,410	74,239	79,539	73,550	74,759	72,889	66,626	58,786	56,794	67,251	73,376
1915	63,964	74,060	82,432	87,354	90,406	88,264	82,877	102,387	*111,023	*117,733	*124,839	*125,359	*127,944	*118,215	*100,592
1916	*128,195	*132,824	*134,334	134,239	*135,277	133,563	*133,089	129,780	128,943	133,184	*141,224	137,739	127,934	*133,162	*133,125
1917	138,629	128,891	*143,093	*151,665	150,400	139,129	*142,113	137,900	135,683	139,455	145,619	142,843	128,263	138,384	140,255
1918	97,822	113,539	143,370	145,815	145,910	147,814	132,322	143,520	136,875	*153,289	148,794	141,083	143,445	*144,430	138,425
1919	135,224	132,396	120,295	101,202	83,935	104,287	112,651	113,332	124,082	104,539	75,779	100,523	107,077	104,064	108,343
1920	130,519	141,739	145,073	120,480	131,661	136,114	134,213	127,992	137,016	136,976	137,726	120,496	106,874	127,846	131,030
1921	96,810	83,279	66,473	53,342	55,622	44,090	66,387	36,713	48,156	51,619	71,044	72,942	62,707	57,270	61,814
1922	72,764	86,324	104,247	116,090	119,215	120,229	103,401	118,112	97,380	108,395	131,164	131,935	132,017	119,621	111,511
1923	142,263	144,660	150,618	*158,549	156,161	144,894	*149,532	141,258	136,881	134,271	132,485	120,551	114,531	130,056	139,822
1924	135,182	153,050	*161,796	128,787	97,779	82,627	126,519	72,223	98,188	108,755	115,756	124,846	137,279	109,449	117,984
1925	155,307	156,348	161,321	137,834	132,883	123,248	144,407	118,634	131,577	134,214	144,030	156,116	152,728	139,472	*141,932
1926	158,931	157,710	*165,504	157,915	151,076	143,621	*155,831	139,807	153,347	150,515	156,713	142,529	133,339	146,039	*150,920
1927	147,039	160,222	*169,439	160,130	157,023	135,621	154,939	129,285	130,707	126,824	128,664	121,320	123,201	126,676	140,761
1928	154,913	163,231	168,475	*173,805	157,298	145,325	*160,429	153,629	156,192	167,447	*173,810	165,624	162,212	*163,209	*161,818
1929	168,323	*182,150	*196,861	192,273	*197,727	*198,062	*189,187	188,409	184,742	182,910	169,602	136,769	117,271	163,631	*176,368
1930	141,035	169,452	164,915	159,300	148,676	137,817	153,317	113,277	118,648	110,105	100,508	9,185	76,735	101,482	127,316
1931	93,852	107,083	118,577	107,462	99,346	82,654	101,162	73,346	66,654	60,000	59,444	61,800	50,500	61,577	81,369
1932	57,690	59,840	53,630	48,970	43,730	35,500	49,850	32,600	31,700	38,580	42,270	40,110	33,500	36,455	43,153
1933	39,600	45,600	33,700	54,450	74,150	100,000	57,950	128,400	107,600	89,000	81,200	59,250	72,850	89,700	73,850
1934	77,999	90,951	102,255	115,901	124,174	115,999	*103,724	58,903	50,495	50,065	54,146	61,117	*178,240	*58,700	*183,200

Pig Iron Production of the United States in Thousands of Gross Tons

(THE IRON AGE figures, including ferroalloys made in blast furnaces, but excluding charcoal iron)

	Jan.	Feb.	March	April	May	June	Half Year	July	Aug.	Sept.	Oct.	Nov.	Dec.	Second Half	Year
1884	208	289	311	302	313	299	1,822	342	321	297	307	304	296	1,867	3,689
1885	278	275	313	297	302	286	1,751	308	305	294	315	333	382	1,937	3,688
1886	368	223	397	*428	*465	455	2,447	*473	460	448	*477	471	*497	*2,826	*5,273
1887	493	463	*522	513	454	359	2,804	413	486	*531	*569	550	548	*3,097	*5,901
1888	507	424	447	453	483	457	2,771	464	492	500	546	566	*616	*3,184	*5,955
1889	601	535	594	564	557	533	*3,384	562	566	564	*626	*642	*684	*3,644	*7,028
1890	*709	653	*734	713	*739	701	*4,249	712	703	706	*742	730	733	*4,326	*8,575
1891	612	492	481	429	512	607	3,133	731	728	726	*789	784	*812	*4,570	*7,703
1892	784	745	792	736	732	690	4,479	690	651	635	700	717	747	4,140	*8,619
1893	728	665	754	739	755	674	4,315	564	407	322	*326	373	431	2,423	6,738
1894	445	426	534	517	386	319	2,627	441	684	640	691	708	744	3,808	6,435
1895	706	617	672	648	668	679	3,990	776	*827	*845	*923	*926	*934	*5,231	*9,221
1896	873	779	810	785	799	751	4,797	721	608	491	499	550	647	3,516	8,313
1897	702	654	747	728	746	710	4,287	719	764	813	901	927	*986	5,110	*9,397
1898	974	895	*1,000	965	978	910	*5,722	924	915	907	974	985	*1,050	*5,755	*11,477
1899	1,033	906	1,022	1,034	*1,086	1,077	*6,158	*1,149	*1,159	1,145	*1,226	1,223	*1,276	*7,178	*13,336
1900	*1,285	1,158	1,264	1,226	1,282	1,215	*7,430	1,132	1,018	939	935	920	1,031	5,975	*13,405
1901	1,162	1,134	1,279	1,257	*1,339	1,318	*7,489	*1,360	1,336	1,300	*1,382	1,362	1,266	*8,006	*15,495
1902	*1,428	1,258	*1,445	*1,475	*1,543	1,447	*8,595	1,442	1,468	1,419	1,481	1,433	1,537	*8,780	*17,375
1903	1,473	1,391	*1,490	*1,608	*1,714	1,673	*9,449	1,546	1,571	1,554	1,426	1,039	847	*7,983	*17,432
1904	924	1,208	1,451	1,561	1,537	1,296	7,997	1,121	1,173	1,358	1,455	1,487	1,616	8,210	16,187
1905	*1,782	1,597	*1,936	1,922	*1,964	1,793	*10,994	1,742	1,844	1,899	62,053	2,014	2,046	*11,598	*22,592
1906	*2,069	1,904	*2,165	2,073	2,097	1,977	*12,287	2,013	1,927	1,971	*2,197	2,188	*2,235	*12,531	*24,818
1907	2,206	2,045	2,226	2,219	*2,295	2,235	*13,226	2,256	2,250	2,184	*2,237	1,828	1,234	12,089	*25,315
1908	1,045	1,078	1,228	1,150	1,166	1,092	6,759	1,218	1,360	1,419	1,567	1,578	1,741	8,883	15,642
1909	1,798	1,707	1,836	1,739	1,863	1,931	10,894	2,103	2,249	*2,385	*2,600	2,547	*2,636	*14,520	*25,414
1910	2,609	2,397	2,618	2,484	2,890	2,265	*14,763	2,149	2,107	2,056	2,093	1,910	1,778	12,093	*26,856
1911	1,759	1,795	2,171	2,065	1,893	1,918	11,477	1,793	1,927	1,977	2,102	2,000	2,043	11,842	23,313
1912	2,058	2,101	2,405	2,375	2,513	2,441	13,893	2,411	2,512	2,464	*2,690	2,631	*2,782	*15,490	*29,383
1913	*2,795	2,586	2,764	2,753	*2,822	2,629	*16,349	2,561	2,546	2,506	2,546	2,233	1,984	14,376	*30,725
1914	1,885	1,888	2,348	2,270	2,093	1,918	12,402	1,958	1,995	1,883	1,778	1,518	1,516	10,648	23,050
1915	1,601	1,685	2,064	2,117	2,263	2,381	12,101	2,563	2,780	*2,853	*3,126	3,037	*3,203	*17,562	29,663
1916	3,185	3,087	*3,339	3,227	*3,361	3,211	*19,410	3,224	3,204	3,202	*3,509	3,312	3,178	*19,629	*39,039
1917	3,151	2,645	3,252	3,335	3,417	3,270	19,070	3,342	3,248	3,134	3,303	3,206	2,883	19,116	38,186
1918	2,412	2,319	3,213	3,288	3,447	3,324	18,003	3,421	3,389	3,418	3,487	3,354	3,434	20,503	38,506
1919	3,303	2,940	3,090	2,478	2,108	2,115	16,034	2,429	2,743	2,488	1,864	2,392	2,633	14,549	30,583
1920	3,015	2,979	3,376	2,739	2,986	3,044	18,139	3,067	3,147	3,129	3,293	2,935	2,704	18,275	36,414
1921	2,416	1,937	1,596	1,193	1,221	1,065	9,428	865	954	986	1,247	1,415	1,649	7,116	16,544
1922	1,645	1,630	2,036	2,072	2,306	2,361	12,050	2,405	1,816	2,034	2,639	2,849	3,087	14,830	26,880
1923	3,229	2,994	*3,524	*3,550	*3,868	3,676	*20,841	3,678	3,450	3,126	3,149	2,894	2,921	19,218	*40,059
1924	3,019	3,075	3,466	3,233	2,615	2,026	17,434	1,785	1,887	2,053	2,477	2,510	2,962	13,674	31,108
1925	3,370	3,214	3,564	3,259	2,931	2,674	19,012	2,664	2,705	2,726	3,023	3,023	3,250	17,391	36,403
1926	3,316	2,923	3,442	3,450	3,482	3,235	19,848	3,223	3,201	3,136	3,334	3,237	3,091	19,222	39,070
1927	3,104	2,941	3,483	3,422	3,391	3,090	19,431	2,951	2,947	2,775	2,784	2,648	2,696	16,801	36,232
1928	2,870	2,900	3,200	3,185	3,284	3,082	18,521	3,072	3,137	3,062	3,374	3,302	3,370	19,317	37,838
1929	3,442	3,206	3,714	3,663	*3,898	3,717	*21,621	3,785	3,756	3,498	3,588	3,181	2,837	20,665	*42,286
1930	2,827	2,839	3,246	3,182	3,233	2,934	18,261	2,639	2,524	2,277	2,165	1,867	1,666	13,139	31,399
1931	1,714	1,707	2,032	2,020	1,994	1,639	11,105	1,463	1,281	1,169	1,173	1,103	980	7,170	18,275
1932	972	964	967	852	783	628	5,168	572	520	592	644	631	546	3,518	8,686
1933	569	554	542	624	887	1,265	4,441	1,792	1,833	1,522	1,356	1,085	1,182	8,902	13,213
1934	1,215	1,264	1,620	1,727	2,043	1,930	9,798	1,225	1,054	898	951	956	†966	†6,052	†15,850

*High records for periods specified. †With December estimated.

Daily Production of Pig Iron in the United States, Gross Tons

	Jan.	Feb.	March	April	May	June	Half Year	July	Aug.	Sept.	Oct.	Nov.	Dec.	Second Half	Year
1884	9,951	9,985	10,019	10,053	10,087	9,966	10,011	11,031	10,348	9,904	9,904	10,126	9,546	10,145	10,078
1885	8,965	9,825	10,106	9,891	9,742	9,527	9,673	9,924	9,855	9,787	10,148	11,113	12,319	10,525	10,103
1886	11,868	11,931	12,817	*14,257	*15,016	*15,159	*13,521	*15,265	14,845	14,910	*15,394	*15,685	*16,041	*15,357	*14,447
1887	15,918	*16,544	*16,826	*17,090	14,633	11,979	*15,489	13,320	15,685	*17,706	*18,346	18,329	17,678	*16,831	*16,167
1888	16,352	14,622	14,422	15,099	15,586	15,239	15,227	14,972	15,869	16,648	17,624	*18,866	*19,871	*17,303	*16,265
1889	19,384	19,124	19,147	18,802	17,980	17,774	*18,699	18,115	18,254	18,809	*20,203	*21,404	*22,053	19,803	19,256
1890	*22,888	*23,320	*23,687	*23,759	*23,816	23,380	*23,476	22,979	22,664	23,521	*23,942	*24,321	23,642	*23,507	*23,492
1891	19,747	17,590	15,512	14,301	16,518	20,226	17,312	23,571	23,465	24,194	*25,456	*26,139	*26,206	*24,834	21,104
1892	25,303	25,679	25,551	24,521	23,622	23,006	24,611	22,263	21,012	21,012	22,583	23,886	24,102	22,501	*23,550
1893	23,482	23,758	24,323	24,654	24,357	22,444	23,841	18,179	13,146	10,720	10,518	12,428	13,901	13,166	18,459
1894	14,350	15,203	17,246	17,229	12,450	10,689	14,515	14,221	18,826	21,339	22,284	23,604	24,011	20,695	17,630
1895	22,766	22,024	21,680	21,619	21,556	22,625	22,044	25,035	*26,661	28,151	*29,788	*30,862	30,143	*28,429	*25,263
1896	28,156	26,861	26,133	26,170	25,784	25,028	26,358	23,255	19,620	16,378	16,079	18,339	20,858	19,107	22,713
1897	22,629	23,375	24,108	24,270	24,063	23,655	23,685	23,210	24,634	27,080	29,071	*30,904	*31,815	27,774	*25,746
1898	31,427	*31,978	*32,262	32,152	31,530	30,334	*31,612	29,817	29,533	30,228	31,406	32,829	*33,881	31,279	*31,444
1899	33,925	32,360	32,948	*34,464	*35,039	*35,899	*34,020	*37,065	*37,374	*38,156	*39,566	*40,782	*41,162	39,012	*36,539
1900	*41,441	41,360	40,759	40,856	41,368	40,504	*41,047	36,507	32,839	31,322	30,167	30,678	33,239	32,474	*36,725
1901	37,498	40,487	41,274	*41,896	*43,206	*43,916	*41,377	43,859	43,090	43,329	*44,587	*45,398	40,845	*43,509	*42,452
1902	*46,054	44,915	*46,613	*49,182	*49,769	48,225	*47,488	46,512	47,360	47,287	47,772	47,763	49,589	*47,716	*47,603
1903	47,509	49,665	*51,305	*53,614	*55,278	*55,774	*52,205	49,877	50,681	51,791	45,989	34,654	27,313	43,386	*47,759
1904	29,795	41,668	46,820	52,039	49,580	43,191	43,831	36,155	37,830	45,261	46,944	49,554	52,129	44,616	44,226
1905	*57,479	57,048	*62,460	*64,068	63,346	59,773	*60,739	56,191	59,473	63,317	*66,317	*67,121	65,991	*63,039	*61,896
1906	66,739	*68,001	*69,859	69,107	67,701	65,891	*67,885	64,948	62,153	65,699	*70,865	*72,922	72,107	*68,103	*67,995
1907	71,149	*73,089	71,871	*73,975	*74,049	*74,486	*73,074	72,763	72,594	72,783	*75,386	60,939	39,815	65,701	*69,357
1908	33,718	37,163	39,619	38,320	37,583	36,404	37,139	39,294	43,865	47,300	50,555	52,595	56,158	48,277	42,739
1909	57,986	60,976	59,232	57,963	62,792	77,103	75,516	*81,565	69,305	67,963	68,589	67,520	63,659	57,349	*73,577
1910	84,149	*85,616	84,450	82,792	77,103	75,516	67,334	57,839	62,150	65,903	67,811	66,648	65,912	64,517	63,870
1911	56,752	64,900	70,039	68,839	61,079	59,586	63,376	77,771	81,046	82,128	*86,772	*87,695	*89,766	*84,188	*80,283
1912	66,384	72,442	77,591	79,181	81,051	81,358	*90,325	82,601	82,121	83,581	82,139	74,453	63,987	78,129	*84,177
1913	*90,172	*92,369	89,147	71,759	91,039	87,619	68,519	65,150	64,363	62,753	57,361	50,611	48,896	57,868	63,150
1914	60,808	67,453	75,739	75,665	67,066	63,226	66,855	82,691	89,666	*95,085	*100,822	*101,244	*103,333	95,444	81,267
1915	51,659	59,813	66,575	70,550	73,015	79,361	*106,651	107,617	103,346	106,746	*113,189	110,394	102,505	*106,684	*106,668
1916	102,746	106,455	*107,667	*107,592	*108,422	*107,053	*105,359	107,820	104,772	104,465	106,550	106,859	92,997	*103,892	104,619
1917	101,643	94,473	104,882	111,165	110,239	109,002	105,359	110,354	109,339	*113,942	112,482	111,802	111,762	*111,432	105,496
1918	77,799	82,839	103,648	109,607	111,175	110,793	99,462	78,539	88,496	82,932	60,115	79,745	84,944	79,071	83,788
1919	106,525	105,006	99,685	82,607	68,002	70,495	88,584	75,839	88,496	82,932	104,310	106,212	97,830	87,222	99,321
1920	97,264	102,720	108,900	91,327	96,312	101,451	99,665	98,931	101,529	104,310	106,212	105,405	47,183	53,196	94,942
1921	77,945	69,187	51,468	39,768	39,394	35,494	52,089	27,889	30,790	32,850	40,215	47,183	53,196	38,671	45,325
1922	53,063	58,214	65,675	69,070	74,409	78,701	66,578	77,592	58,586	67,791	85,092	84,990	99,577	80,596	73,645
1923	104,181	106,939	113,673	*118,324	*124,764	122,548	*115,147	118,656	111,274	104,184	101,586	96,476	94,225	104,444	*109,415
1924	97,384	106,026	111,809	107,781	84,358	67,539	95,794	57,577	60,875	68,439	79,907	83,656	95,539	74,314	84,995
1925	108,720	114,791	114,975	108,632	94,542	89,115	105,039	85,936	87,241	90,873	97,528	100,767	104,853	94,519	99,831
1926	106,974	104,408	111,032	115,004	112,304	107,844	109,660	103,978	103,241	104,543	107,553	107,890	99,712	104,467	107,043
1927	100,123	105,024	112,366	114,074	109,385	102,988	107,351	95,199	95,073	92,498	89,810	88,279	86,960	91,313	99,266
1928	92,573	100,004	103,215	106,183	105,931	102,733	101,763	99,091	101,180	102,077	108,832	110,084	108,705	104,983	103,385
1929	111,044	114,507	119,822	122,087	*126,745	123,908	*119,562	122,100	121,151	116,585	115,745	106,047	91,513	112,307	*115,855
1930	91,209	104,390	104,715	106,062	104,283	97,804	100,891	85,146	81,417	75,890	69,831	62,237	53,732	71,401	86,025
1931	55,299	60,950	65,556	67,317	64,325	54,621	61,356	47,201	41,308	38,964	37,848	36,782	31,625	38,955	50,065
1932	31,380	33,251	31,201	28,430	25,276	20,935	28,412	18,461	17,115	19,753	20,800	21,042	17,615	19,117	23,737
1933	18,348	19,798	17,484	20,787	28,621	42,166	24,536	39,521	59,142	50,742	43,754	36,174	38,131	48,380	36,199
1934	39,201	45,131	52,243	57,561	65,900	64,338	54,134	57,810	34,012	29,935	30,679	31,898	73,175	*32,900	*43,421

Fabricated Structural Steel Orders in the United States, Net Tons

(From United States Department of Commerce Through 1932; 1933 Figures Computed by American Institute Steel Construction, Inc.)

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1909	70,200	70,200	187,200	261,000	280,800	160,200	192,600	205,200	109,800	97,200	127,800	131,400	1,893,600
1910	159,360	128,640	167,040	153,600	192,000	205,440	101,760	115,200	78,720	76,800	63,360	90,240	1,532,160
1911	114,800	94,800	135,300	114,800	129,150	159,900	141,450	166,050	153,750	106,600	180,400	178,350	1,674,850
1912	154,070	169,260	147,560	128,030	219,170	160,580	154,070	175,770	141,050	199,640	138,880	145,390	1,933,470
1913	130,500	162,000	110,250	90,000	119,250	96,750	130,500	96,750	65,250	78,750	60,750	60,750	1,201,500
1914	140,740	143,010	172,520	199,760	129,390	127,120	154,360	63,560	86,260	79,450	45,400	79,450	1,421,020
1915	57,750	69,300	147,840	143,220	140,910	184,800	198,660	196,350	154,770	180,180	242,550	279,510	1,995,840
1916	164,220	178,500	242,760	173,740	190,400	138,040	114,240	152,320	126,140	183,260	185,640	204,680	2,053,940
1917	147,620	142,780	164,560	147,620	135,520	113,740	101,640	91,960	70,180	147,620	186,340	275,880	1,725,460
1918	136,740	144,800	121,600	165,120	154,800	144,480	299,280	147,060	154,800	110,940	69,660	74,820	1,723,440
1919	31,920	34,580	47,880	66,500	130,340	172,900	196,840	207,480	207,480	207,480	183,540	226,100	1,713,040
1920	207,000	262,200	231,840	187,680	171,120	138,000	138,000	110,400	118,680	71,760	74,520	71,760	1,782,960
1921	50,940	39,620	82,070	87,730	79,240	104,710	96,220	93,390	135,840	152,820	155,650	113,200	1,191,430
1922	121,600	133,760	234,080	258,400	240,160	221,920	206,720	206,720	194,560	176,320	152,000	185,440	2,331,680
1923	227,760	243,360	290,160	243,360	177,840	165,360	162,240	184,080	165,360	159,120	171,600	249,600	2,439,840
1924	224,940	228,200	221,680	208,640	192,340	208,640	224,940	195,600	211,900	211,900	270,580	247,760	2,647,120
1925	187,380	194,320	225,550	256,780	229,020	284,540	274,130	267,190	270,660	298,420	239,400	253,310	2,890,730
1926	208,800	208,800	234,000	252,000	266,400	262,800	248,400	284,400	216,000	228,200	223,200	259,200	2,894,400
1927	195,000	240,000	232,500	262,500	232,500	225,000	341,250	270,000	262,500	288,750	236,250	262,500	3,048,750
1928	207,900	265,650	257,950	234,850	308,000	296,450	296,450	354,200	319,550	257,950	242,550	246,400	3,287,900
1929	256,025	260,635	334,565	313,775	321,475	324,170	329,175	340,725	297,990	319,550	212,135	297,605	3,597,825
1930	238,800	267,600	236,800	222,800	297,200	253,600	270,000	252,000	155,600	209,200	151,200	152,800	2,707,600
1931	158,000	158,800	178,800	284,800	152,400	172,400	159,600	124,000	194,400	109,200	90,800	97,600	1,880,800
1932	48,400	62,900	64,400	64,800	99,800	86,800	67,200	78,800	111,200	74,400	51,600	143,600	955,000
1933	93,200	63,700	87,900	56,200	52,100	101,300	67,700	95,600	72,500	63,700	65,000	103,900	922,800
1934	91,594	75,294	105,537	121,552	78,608	122,706	73,723	94,186	62,657	65,037	85,250	*81,345	1,057,489

*With December estimated.

Bookings of Fabricated Steel Plate in the United States, Net Tons

(From United States Department of Commerce)

	Jan.	Feb.	March	April	May	June	Half Year	July	Aug.	Sept.	Oct.	Nov.	Dec.	Second Half	Year
1923	64,832	61,797	75,065	59,850	40,081	62,736	364,361	62,510	40,990	42,945	38,598	31,846	28,806	245,695	610,056
1924	25,563	19,803	25,341	23,688	29,429	34,125	167,949	26,268	36,287	23,270	28,566	36,881	52,606	203,878	361,827
1925*	30,013	24,167	26,777	27,656	32,889	38,496	179,998	34,382	40,660	31,001	34,766	32,847	35,792	209,448	389,446
1926*	29,965	39,889	43,089	39,662	52,890	44,938	250,439	37,300	51,342	38,860	45,139	63,271	30,834	265,939	516,378
1927	36,043	59,843	55,675	47,611	38,063	28,936	266,171	35,609	48,780	38,863	47,296	27,524	35,877	233,949	500,120
1928	51,647	64,909	55,016	55,552	49,313	40,738	317,175	41,629	51,008	43,499	59,836	62,914	52,204	311,090	628,265
1929	40,570	70,314	69,344	54,246	58,293	57,975	350,739	58,456	51,590	51,842	45,661	52,642	27,742	287,936	638,675
1930	57,083	34,662	46,137	45,454	38,328	41,774	263,439	38,283	36,513	41,066	30,197	33,151	26,787	205,996	469,435
1931	27,518	24,438	31,056	29,916	26,210	22,806	161,944	27,261	24,282	33,473	20,839	18,268	16,442	140,565	302,509
1932	17,613	17,755	12,564	14,074	17,888	18,383	98,277	12,485	11,916	11,109	16,737	7,873	9,510	69,630	167,907
1933	11,128	16,588	8,903	9,502	16,243	37,020	99,384	20,058	16,320	17,964	14,466	13,692	.....	98,666	198,050
1934	15,897	14,641	38,924	20,085	21,891	27,395	138,833	12,523	16,293	15,108	16,581	16,629	.....	.....	.....

*During these years additional plants were added to those reporting monthly tonnages.

Steel Sheets Produced by Independent Makers, Net Tons

(From National Association of Flat-Rolled Steel Manufacturers)
(Hot-Rolled Annealed, Galvanized and Full-Finished)

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1919	132,796	127,168	110,339	112,720	108,739	119,363	115,324	129,861	102,035	79,872	128,617	143,405	1,410,239
1920	185,271	177,410	198,606	165,811	161,645	166,819	142,023	188,458	198,467	202,703	185,450	85,204	2,057,867
1921	37,011	45,520	74,239	85,592	106,969	83,374	49,096	94,900	106,454	131,577	127,983	82,198	1,024,913
1922	86,130	122,439	166,244	184,979	218,739	210,464	179,100	228,398	202,600	243,476	242,562	205,239	2,290,370
1923	260,520	237,919	279,475	251,808	260,006	218,432	174,910	234,112	185,577	225,714	188,144	155,299	2,671,916
1924	274,097	275,118	278,767	234,000	176,582	114,807	144,291	190,436	217,981	247,222	224,931	259,794	2,638,026
1925	317,424	283,290	290,308	280,082	260,470	266,290	246,404	270,212	295,810	348,714	336,021	326,960	3,521,985
1926	328,643	299,553	319,132	294,811	264,541	268,448	239,764	293,703	307,459	314,598	278,455	238,345	3,447,452
1927	256,856	282,171	359,340	316,100	309,360	300,706	237,243	266,645	220,919	245,765	232,041	260,130	3,285,276
1928	316,541	330,565	366,127	327,909	349,367	311,629	267,684	329,396	318,907	369,243	358,402	302,182	3,947,952
1929	391,404	326,468	364,202	375,256	393,430	337,841	323,905	366,734	302,490	319,660	204,071	181,916	3,887,377
1930	291,529	275,952	259,658	308,988	274,220	205,675	186,206	173,956	179,928	193,934	148,550	145,125	2,643,721
1931	167,865	192,218	224,323	213,608	201,846	147,843	174,890	123,752	116,842	122,739	102,758	101,670	1,890,254
1932	118,921	124,157	110,559	96,180	85,232	60,956	57,417	89,817	70,817	108,111	77,489	77,489	1,121,077
1933	85,337	91,723	64,724	111,942	139,696	166,272	188,143	203,893	180,304	146,106	102,585	113,111	1,593,836
1934	163,622	194,830	220,282	214,522	256,537	199,438	85,286	77,197	76,051	104,898	143,057	.....	.....

Shipments of Steel Barrels in the United States, Number

(From United States Department of Commerce)

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1921	120,903	125,789	140,382	191,155	137,862	137,766	148,852	239,263	180,172	255,229	200,306	190,778	2,068,457
1922	178,432	202,960	336,952	400,428	450,744	533,888	441,984	488,542	412,896	378,966	388,139	402,639	4,616,670
1923	457,824	431,093	565,718	544,722	520,978	461,251	468,047	482,504	365,580	393,496	343,471	321,440	5,356,124
1924	303,668	362,725	394,766	420,129	425,397	382,550	407,258	398,312	389,064	441,851	389,230	407,474	4,722,414
1925	415,040	407,781	510,928	605,424	569,670	508,880	506,894	495,736	503,221	555,981	498,070	474,742	6,052,364
1926	469,432	518,104	622,312	608,056	582,352	624,082	593,611	511,542	508,548	497,031	505,383	546,292	6,586,845
1927	525,518	503,183	568,821	609,090	575,712	605,123	576,602	610,454	525,374	572,893	497,345	454,638	6,624,754
1928	474,159	514,362	644,521	661,949	694,843	717,496	645,881	675,600	595,640	661,009	568,353	549,913	7,403,726
1929	548,581	563,532	743,407	775,481	834,432	779,567	782,411	809,860	655,314	638,681	567,257	619,058	8,317,581
1930	643,120	599,324	785,951	766,617	736,147	638,358	621,091	552,265	565,204	619,558	500,409	406,327	7,434,371
1931	427,622	449,485	554,332	600,566	618,801	549,781	581,450	455,502	452,960	492,145	444,201	385,435	6,012,280
1932	352,135	369,882	453,621	452,191	432,455	654,561	353,336	360,509	398,241	417,470	376,647	307,372	4,928,420
1933	292,609	272,432	371,945	402,506	467,695	568,437	552,923	470,632	524,719	789,474	582,299	556,627	5,852,298
1934	660,688	520,987	628,485	590,337	426,175	607,692	528,847	318,678	368,771	575,281	466,933		

Automobiles Produced in the United States and Canada

(Cars and Trucks)

(From United States Census Bureau and Dominion Bureau of Statistics)

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total— United States and Canada
1923	256,019	290,130	374,600	395,086	414,256	395,025	343,726	358,572	337,337	375,864	323,675	316,260	4,180,450
1924	330,177	384,320	400,658	392,249	332,221	263,507	279,538	291,009	304,321	302,180	241,654	215,952	3,737,786
1925	251,247	296,158	390,247	452,851	439,195	413,944	410,987	269,199	338,532	457,094	383,021	325,325	4,427,800
1926	324,477	382,490	455,841	460,838	450,101	408,020	374,818	442,136	416,433	349,091	266,129	175,287	4,505,661
1927	254,284	323,390	417,763	430,993	431,356	343,025	280,383	322,520	271,572	227,430	140,987	136,677	3,580,380
1928	240,191	336,300	430,783	434,315	459,725	425,195	417,312	492,543	436,507	415,820	268,909	243,541	4,601,141
1929	422,538	497,705	626,076	663,811	636,250	567,424	518,301	512,842	429,729	394,540	226,997	125,502	5,621,715
1930	283,610	345,961	417,118	468,281	444,699	349,596	275,721	234,160	228,606	158,942	142,161	161,323	3,510,178
1931	178,344	229,811	289,398	354,098	329,901	257,475	222,710	191,741	143,212	81,582	70,114	123,973	2,472,359
1932	123,075	122,895	127,277	155,136	192,516	190,218	116,615	94,392	86,492	51,625	61,761	109,492	1,431,494
1933	132,183	108,745	121,904	184,687	223,807	257,050	235,897	238,934	197,608	138,365	62,974	83,827	1,985,981
1934	163,811	240,278	345,443	373,108	351,813	321,970	277,690	244,713	174,451	136,268	80,112	†175,343	†2,885,000

In no year prior to 1922 did total United States production reach 2,200,000 units.
†With December estimated.

Railroad Freight Cars and Locomotives Ordered in the United States

(From Railway Age)

	Freight Cars	Locomotives		Freight Cars	Locomotives		Freight Cars	Locomotives
1915	109,792	1,612	1922	180,154	2,600	1929	111,218	1,212
1916	170,054	2,910	1923	94,471	1,944	1930	46,360	440
1917	79,367	2,704	1924	143,728	1,413	1931	10,880	235
1918	114,113	2,593	1925	92,816	1,055	1932	1,968	12
1919	22,062	214	1926	67,029	1,301	1933	1,685	42
1920	84,207	1,998	1927	72,006	734	1934	*23,431	*163
1921	23,346	239	1928	51,200	603			

*December estimated.

Production of Steel Trackwork in the United States

(For T-rail track of 60 lb. and heavier)

(From American Iron and Steel Institute, in Net Tons)

	Jan.	Feb.	March	April	May	June	Half Year	July	Aug.	Sept.	Oct.	Nov.	Dec.	Second Half	Year
1925	11,096	14,392	17,965	16,792	17,075	17,416	94,736	13,858	12,982	11,373	12,689	12,281	13,475	76,658	171,394
1926	15,247	16,158	19,756	19,547	19,196	18,762	108,666	15,635	15,203	15,159	15,568	12,225	14,549	87,339	196,005
1927	12,969	13,678	19,216	17,081	16,768	14,557	94,269	13,217	13,387	10,999	9,914	9,706	9,139	66,362	160,631
1928	9,332	11,371	15,058	13,511	14,139	13,718	77,129	11,776	11,039	10,768	9,493	8,379	11,061	62,516	139,645
1929	10,344	12,180	14,927	16,815	16,332	14,839	85,437	13,844	14,818	12,962	12,902	11,326	10,826	76,678	162,115
1930	11,830	12,524	13,096	13,508	12,779	10,553	74,290	8,774	6,812	5,642	5,192	4,212	5,174	35,806	110,116
1931	5,626	6,321	8,944	8,564	7,453	5,705	42,613	4,409	3,924	3,472	2,162	1,948	2,373	18,288	60,901
1932	2,936	2,765	3,229	3,340	3,061	1,975	17,306	1,890	1,797	1,430	1,245	1,765	1,845	9,972	27,278
1933	1,984	1,822	2,013	1,662	1,768	2,471	11,720	2,982	3,425	3,845	3,006	3,087	2,759	19,104	30,824
1934	2,811	3,310	4,446	6,132	5,764	6,184	28,647	5,226	5,364	3,383	2,153	2,212	.....	.....	.....

Unfilled Orders, United States Steel Corp.

(End of month, in thousands of gross tons)

	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Jan.	3,111	5,380	7,827	4,614	4,249	7,923	11,474	9,478	6,684	9,285	7,573	4,242	6,911	4,798	5,037	4,883	3,800	4,276	4,109	4,469	4,132	2,648	1,899
Feb.	3,401	5,454	7,657	5,026	4,345	8,569	11,577	9,288	6,011	9,502	6,934	4,141	7,284	4,913	5,285	4,617	3,597	4,398	4,144	4,480	3,965	2,546	1,854
March	3,447	5,305	7,469	4,654	4,256	9,331	11,712	9,066	5,431	8,892	6,285	4,494	7,403	4,783	4,864	4,380	3,553	4,335	4,411	4,571	3,995	2,472	1,841
April	3,219	5,665	6,979	4,277	4,162	9,830	12,183	8,742	4,801	10,360	5,845	5,097	7,289	4,208	4,447	3,868	3,456	3,872	4,428	4,354	3,898	2,321	1,865
May	3,113	5,751	6,324	3,998	4,265	9,938	11,887	8,338	4,282	10,940	5,482	5,254	6,981	3,628	4,050	3,649	3,051	3,417	4,304	4,059	3,620	2,177	1,930
June	3,361	5,807	5,807	4,033	4,678	9,640	11,383	8,919	4,893	10,979	5,118	5,636	6,386	3,263	3,710	3,479	3,053	3,637	4,257	3,968	3,479	2,035	2,107
July	3,584	5,957	5,399	4,159	4,929	9,594	10,844	8,884	5,579	11,118	4,830	5,776	5,911	3,187	3,539	3,603	3,142	3,571	4,088	4,022	3,405	1,966	2,020
Aug.	3,696	6,163	5,223	4,213	4,908	9,660	10,407	8,759	6,109	10,805	4,532	5,950	5,415	3,290	3,513	3,542	3,196	3,624	3,658	3,580	3,169	1,970	1,890
Sept.	3,611	6,552	5,004	3,788	5,318	9,523	9,833	8,298	6,285	10,375	4,561	6,692	5,036	3,474	3,717	3,594	3,148	3,698	3,903	3,424	3,145	1,985	1,776
Oct.	3,694	7,594	4,514	3,461	6,165	10,015	9,010	8,353	6,473	9,837	4,287	6,902	4,673	3,525	4,109	3,684	3,341	3,751	4,087	3,482	3,119	1,997	*
Nov.	4,142	7,853	4,396	3,325	7,189	11,059	8,897	8,125	7,128	9,021	4,251	6,840	4,369	4,032	4,582	3,807	3,454	3,673	4,125	3,640	2,934	1,968	.....
Dec.	5,085	7,932	4,282	3,837	7,806	11,547	9,382	7,379	8,265	8,148	4,268	6,746	4,445	4,817	5,033	3,961	3,973	3,977	4,417	3,944	2,735	1,968	.....
Dec.	3,655	6,284	5,007	4,115	5,189	9,719	10,716	8,635	5,935	10,022	5,331	5,618	6,099	3,993	4,324	3,922	3,397	3,852	4,161	4,034	3,466	2,172	1,909

*Publication discontinued and steel shipments issued thereafter.

Monthly Shipments of Steel Products by United States Steel Corp., Net Tons

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	*Total
1930	1,104,168	1,141,912	1,240,171	1,188,456	1,203,916	984,739	946,745	947,402	867,282	784,646	676,016	579,098	11,624,294
1931	800,031	762,522	907,251	878,558	764,178	653,104	593,900	573,372	486,928	476,032	435,697	351,211	7,676,744
1932	426,271	413,001	388,579	395,091	338,202	324,746	272,448	291,688	316,019	310,097	275,594	227,576	3,974,062
1933	285,138	275,929	256,793	335,321	455,302	603,937	701,322	668,155	575,161	572,897	430,358	600,639	5,805,235
1934	331,777	385,500	588,209	643,009	745,063	985,337	369,938	378,023	370,306	343,962	366,119	.....	.....

*Less yearly adjustment.

Shipments of Lake Superior Iron Ore by Water, Gross Tons

(Reported by the Lake Superior Iron Ore Association)

	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Shipments	42,623,572	54,081,298	58,537,855	51,107,136	53,980,874	65,204,600	46,582,982	23,467,786	3,567,985	21,623,898	22,249,600

A New Old Industry Looms on the Horizon

(CONCLUDED FROM PAGE 153)

or 40-ft. strips, four and fraction feet wide, could be rolled for car roofs. In such a case the two strips could be welded or riveted together to cover the entire freight car. Strips of this size could be rolled on almost any hot-strip mill and then cold-reduced to about 13 or 14 gage, which is the usual requirement of the railroads.

The urge toward new designs in rolling stock has extended to street railroads and metropolitan rapid transit systems. Two articulated five-section cars, one built of stainless steel and the other of aluminum alloy, were delivered to the Brooklyn-Manhattan Transit Corp., New York, in 1934. Both of them, because of their light weight, permit a speeding up of local service to almost express schedule through quicker acceleration and deceleration. A further advantage of the weight saving is that it permits the installation of steel or metal cars without reinforcement of the antiquated elevated structures which were built for wooden cars.

Electric railroad cars have been built of aluminum alloy since 1926. A list of them was published in THE IRON AGE of Aug. 2, 1934. An experimental street car of Cor-Ten was built last year according to specifications prepared by the President's Conference Committee of the American Transit Association. Later the Capital Transit Co., District of Columbia, ordered 20 street cars of this type.

Railroads, as well as independent transportation systems, have been important purchasers of motor buses. Many of the same considerations entering into the design and construction of street cars and railroad coaches apply in varying degree to motor coaches.

A trend toward an increased use of alloys in the building of motor buses is shown in the recent bringing out of a new line of all-metal city service coaches by the Bender Body Co., Cleveland. Dispensing with the usual conventional chassis frame, the body is of a combination body and chassis type. The under



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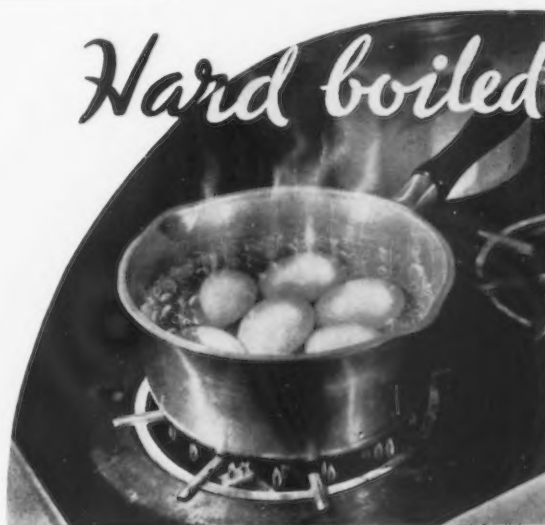
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body is pressed from chrome-nickel alloy steel S.A.E. 3135 with a content of 0.35 per cent carbon, 1.5 per cent nickel and 0.5 per cent chromium, full annealed. The side sills are of galvanized angles and the side and end posts are stamped from galvanized

sheet steel. The side girder plates and stiffeners, the belt section and the rafters are made of aluminum alloy, and the outside lower panels and letterboard and roof panels are made of hardened aluminum. The coach is manufactured in three standard sizes.



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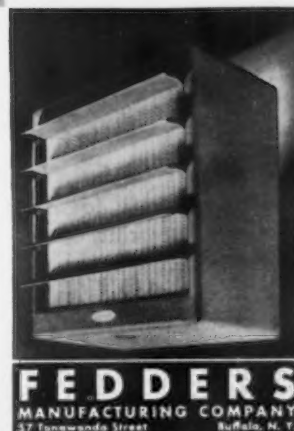
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torches may be mounted on the bar, and for quantity production a magnetic tracer can be used. Cutting speed is regulated by turning a speed-governor screw on the variable-speed tracer motor. Slow starting speed and smooth pick-up of the driving motor eliminate jarring of the tracer bar. Rugged construction, accurately machined bearing surfaces, and use of anti-friction bearings feature these machines, the cutting area of which is a rectangle $4\frac{1}{2}$ ft. long and 11 ft. wide, with one 16-ft. rail section, or any length desired with additional sections.

The company also introduced a machine that operates on the same principle as a previous model but with the cutting area located differently and employing a different pantagraph construction. There is no tracer bar, the tracer being attached to the end of one pantagraph arm and the cutting torch to the other end. The machine is for single-torch operation only. The tracing table for holding the drawing or cam is part of the machine itself, being located on top of the bed between the vertical posts. The cutting area is 30 in. square or a 36-in. diameter circle.

Small Motor-Propelled Machines

A compact, motor-propelled unit for cutting material up to 2 in. thick into straight, circular or irregular shapes over practically unlimited areas, was also added to the same company's line. Travel speeds are quickly adjustable and the machine is guided by hand along the contour scribed directly on the plate. Design features enable the operator to change the direction of the machine with unusual ease. The machine will cut beveled as well as perpendicular edges and, with the radius rod in place, will cut arcs or complete circles automatically. It will travel up a 10-deg. incline on hot-rolled steel plate.

Another compact, portable machine of wide range is designed for automatic straight line, straight bevel and circle and ring cutting; also for plate edge preparation and the cutting of curved or irregular-shaped pieces. It can cut and subsequently anneal the cut edge, cut two bevels in a steel plate simultaneously and perform other complicated operations. Motor, blowpipe, controls and adjustments are carried on a chassis, which for

Substantial Developments in All Types of Welding

(CONTINUED FROM PAGE 160)

is also employed for drilling operations, particularly for depths beyond the reach of cutting tips.

Oxy-acetylene cutting machines brought out during the year included a large unit, the pantagraph assembly of which is mounted on a carrier that travels on rails to provide greatly extended cutting area. Automatic con-

trol of the carrier driving motor by the movement of the pantagraph arms is a feature. As these arms reach certain limiting positions they operate switches which function to reverse the motor. The cutting torches are on the same bar as the tracer and conform closely to the movement of the latter. As many as six cutting

straight-line work runs on an I-beam track. The adjustable slide for the blowpipe holders may be swung into any horizontal position over a working arc of 250 deg. Two torches may be mounted on the same or opposite sides of the machine and positioned independently; protractor scales facilitate accurate positioning. Blowpipes can be tilted 90 deg. in either direction parallel to the side of the machine and up to 90 deg. at right angles from the side. Speeds are selected through an indicator and a gear lever, and a simple lever control is provided for forward and backward travel of the machine.

Mounting Overhead Expense Spurs Handling Progress

(CONCLUDED FROM PAGE 260)

THE past year has witnessed the appearance of new weighing devices. Included is a weight printing scale placed on the market by the Toledo Scale Co. to enable the user to keep a printed record of weights passing over the scale; upon depressing a print button, the unit automatically selects and prints the correct weight figure on an inserted ticket, a continuous strip, or on both. Fairbanks, Morse & Co. has announced a new production weighing scale, combining a dial face, a mechanical recorder and a roller conveyor platform.

The foregoing do not include all the new products of the materials-handling industry for 1934, but only those which have come to the attention of the writer. They are sufficient to indicate that the materials-handling manufacturers have not been lulled to sleep by the depression, nor frightened by poor business conditions into fears for the future of their industry. Equipment has found place in new applications, as is witnessed by the reports of Holly Pneumatic Systems, Dracco Corp., Fuller Co., and others to the effect that their pneumatic transfer systems have made inroads into the brewery and distillery markets for reducing cost of handling malt shipments. Additional needs for new handling methods will be forthcoming in the future, and, as usual will be met by modern equipment.

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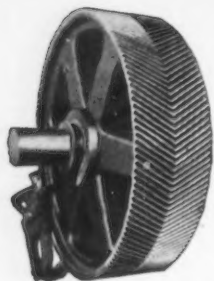
British Societies Plan Welding Symposium

A SYMPOSIUM of technical papers on the welding of iron and steel is being arranged by the Iron and Steel Institute (British) in cooperation with 13 or more other societies and technical institutions. It will be held May 2 and 3 at the Lecture Theater of the Institution of Civil Engineers, London, in conjunction with the annual meeting of the Iron and Steel Institute, which opens May 1.

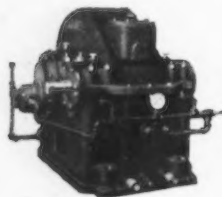
The object is to review the position of welding in all its industrial aspects, both in Great Britain and in other

countries. The papers will cover five different general topics, namely: Present-day practice and problems of welding in the engineering industries, including airplane, automobile, electrical, pressure vessel, shipbuilding, and structural and bridge building; welding practice and technique; metallurgy of welding; specification, inspection, testing and safety aspects of welding; and current research projects in welding. K. Headlam-Morely, 28, Victoria Street, London, S.W.1, is secretary of the Iron and Steel Institute.

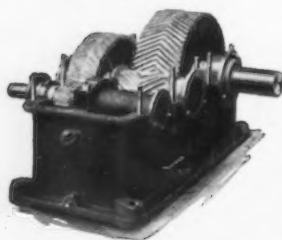
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Huge Latent Demand for Durable Goods Is Key to Recovery

(CONTINUED FROM PAGE 186)

The railroads continued to be poor customers of the capital goods industries in 1934, although freight car shipments were larger than in 1932 when the volume of business approached zero. Recovery in the iron and steel industry has been substantial when compared with 1932

volumes, reflecting comparable increases in the demand for industrial supplies and equipment, such as steam pumps, boilers, machine tools and forging equipment, electric motors, heavy hardware, etc.

The better showing made by most of the durable goods industries in

1933 and 1934 is still more significant when considered in relation to the enormous latent demand represented by the large amount of deferred maintenance and replacement which must take place in order to restore and rehabilitate the nation's productive facilities.

An approximate measure of the volume of this deferred demand can be gained by comparing the heavily shaded areas above the 1923-1928 average line in each of the charts with the much larger, lightly shaded areas below the average. Using the average rate of operations for the years 1923 to 1928 as an assumed "normal expectancy" for the future, undoubtedly errs on the side of conservatism rather than optimism. With a growing population, a rising standard of living and a further mechanization of the operations of commerce and industry, it is reasonable to expect a continued rising trend in the demand for durable goods of all kinds, both those used by industry in productive processes and those used by the consumer in his daily life.

What the Shortage Means in Terms of Industrial Activity

Even on the conservative assumption that the durable goods industries can be expected to do no more than maintain the operating rates of nearly a decade ago, it is clear that they are far behind schedule at the present time. Accumulated shortages shown graphically in the charts are estimated below in terms of the number of months of operations at the average 1923-1928 rate required to make good existing deficiencies:

	Months
Pig iron.....	29
Steel ingots.....	23
Fabricated steel plate.....	24
Iron and steel heavy hardware.....	17
Cast iron boilers.....	12
Steam power and cent. pumps.....	28
Machine tools and forging machinery	21
Electric motors.....	32
Freight cars.....	48
Automobiles.....	19
Residential buildings.....	49

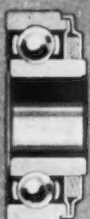
Existing shortages expressed in this way range from as low as one year's shipments, in the case of cast iron boilers, to four years or more, in the case of residential buildings and freight cars. More than two years of normal production would be required to make good present deficiencies in pig iron, steel ingots, fabricated steel plate, steam power and centrifugal pumps and electric



Type P—Closed type ball bearing with one grease-retaining plate.



Type PP—Closed type ball bearing with two grease-retaining plates.



Type GS—"Greaseal" felt-protected, grease-packed ball bearing.



Type EGS—Adjustable, felt-protected, grease-packed ball bearing.



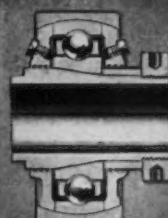
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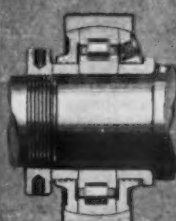
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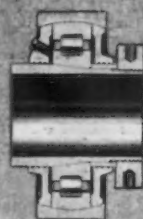
"7000-P"



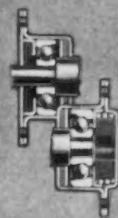
Type LTW—Self-aligning ball bearing with swiveling grease-retaining side plates and adapter sleeve.



Type RLSW—Self-aligning roller bearing with swiveling grease-retaining side plates.



Type RLW—Self-aligning roller bearing with swiveling grease-retaining side plates and adapter sleeve.



CUP MOUNTING—Designed to use with small open type ball bearings in high-speed devices; furnished as complete units.

SELF-SEALED

Out of their experience of more than 23 years, NORMA-HOFFMANN engineers—pioneers in the design of enclosed and self-protected bearings—have developed and patented a range of types which meets practically every bearing condition and which affords the mechanical world

The Most Complete Line of SELF-PROTECTED BEARINGS in America

The "GREASEAL" Series of Felt-Protected Ball Bearings—in the three types illustrated above—is marked by the following outstanding features which make for better performance and more lasting satisfaction:—thick, closely-fitting felts between removable plates forming an effective labyrinth against the recessed inner ring --- FELT SEAL REMOVABLE in its entirety for inspection, cleaning or renewal of grease --- wide, solid inner and outer rings, with maximum contact on shaft and housing, make inserts in housing unnecessary and militate against slippage, looseness, and escape of lubricant past outer ring --- felt seal within confines of both rings and not exposed to injury --- seal construction avoids race distortion, assuring dimensional exactness and quiet running --- grease capacity ample for long periods of service. . . . Eight other types of Self-Protected PRECISION Bearings are here pictured and indexed. Write for the complete Catalog. Let our engineers aid you in selection and application.

NORMA-HOFFMANN BEARINGS CORPN.

STAMFORD, CONN., U. S. A.

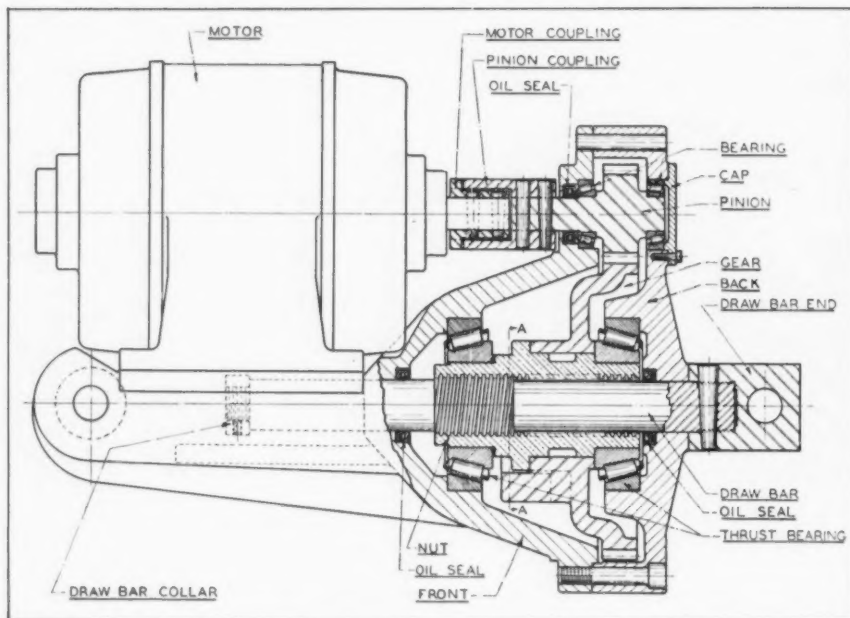
"NORMA-HOFFMANN" PRECISION BEARINGS

BALL, ROLLER AND THRUST

PULL-PUSH-POWER

ELECTRICALLY OPERATED

AS CONCEIVED AND DEVELOPED
BY THE CUSHMAN CHUCK COMPANY



PULL-PUSH-POWER is the name of a Non-Rotating Power Unit which converts the energy of a small, high-torque motor into a great and readily controlled straight-line force. For a full description see the Cushman Bul. No. 127.

The lifting and impelling forces capable of development are almost unlimited, but, as at present made, the lifting power ranges from 160 lbs. to 2300 lbs., and the impact force from 3,000 lbs. to 35,000 lbs. The time cycle of the draw bar is based on a 4 in. stroke in one second, but the distance of travel can be varied to meet the requirements of the work.

The power load is carried in both directions at equal draw bar speed, and standard housings are provided for three different machine mountings, namely, Base, Clevis, and Flange types.

The operating cost is trifling, as the current is only used while the power is being applied.

These Units consist of comparatively few parts, and all moving ones operate in an oil bath. They are practically trouble-free.

Among the many industrial purposes for which we recommend Pull-Push-Power Units are such machine equipments as vises, clamping fixtures, arbor presses, and jacks;

Also for operating the power clamps of shears and welding machines;

For the moulding presses of many plastic materials; for instance bakelite, rubber, clay, etc.;

For operating the die movement and drawing cores in die casting equipment;

For opening and closing industrial doors and switches.

In fact, the uses to which a PPP Unit can be put must be indefinitely extended for we are finding others all the time. *It may be that you have one that our engineers can work into shape, if you will ask us.*

THE CUSHMAN CHUCK COMPANY, HARTFORD, CONN.

motors, and somewhat shorter periods for machine tools and forging machinery, heavy hardware and automobiles. If these shortages were all to be filled by, say, the end of the present decade, it is obvious that the construction and heavy industries would have to operate far above the present rate during the next six years. The 12 months' shortage in cast iron boilers, for example, would necessitate shipments equivalent to 14 months' normal production on the average for each of the next six

years, or 16 per cent above the average operations in the pre-depression period. In the case of all the other industries shown, operations would have to be at a considerably higher rate.

These conclusions are supported by the observation of Col. Leonard P. Ayres of the Cleveland Trust Co., who estimates that the value of new construction and durable goods needed to fill existing shortages is approximately 85 billion dollars, a sum which is equivalent to the total national in-

come in the year 1929. He further estimates that the heavy industries would have to operate "at 25 per cent above their normal rates for 10 years" if accumulated shortages are to be made up in that period.

Steel Finishing Capacity Increased

(CONTINUED FROM PAGE 222)

Under Way

Cambria Plant: Electric motor drive for rod mill at rod and wire department.

Maryland Plant: Turbo blower for blast furnaces, new blast furnace D replacing former D furnace, gas cleaning and distributing system for blast furnace gas, three gas disintegrators, moisture eliminator and mains for clean blast furnace gas; installing 8-in. bar mill, including buildings and equipment, one continuous furnace and 3-high roughing mill at sheet mills.

REPUBLIC STEEL CORPN.

Youngstown District: New welding unit of larger capacity has been installed in No. 1 electric weld tube mill. Forming and sizing equipment for No. 2 electric weld tube mill has been rearranged and improved for high grade casing. In the finishing end of the electric weld tube mill a normalizing furnace, additional cut off machines and an upsetting machine have been installed.

Warren District: A cleaning system including a flying shear has been installed in the cold strip department. Copper plating equipment installed.

Central Alloy District: A billet chipping machine has been installed and a tube type annealing furnace is being installed.

Buffalo District: No. 6 open-hearth furnace rebuilt to improved design. Motor driven blast furnace blower being installed. Die roll finishing department has been enlarged to take care of increased production.

Chicago District: Equipment has been installed for producing railroad spikes. Heat treating capacity has been enlarged by the construction of an additional furnace. Two new billet furnaces of larger capacity have been constructed for the 12-in. mill.

Birmingham District: No. 2 blast furnace relined and rebuilt to improved design.

Upson Nut Division: New bolt and nut machines, also new threading machine of improved design are being installed.

Union Drawn Steel Co.: Wire patenting furnace with auxiliary equipment has been installed.

Berger Mfg. Co.: Equipment for producing voting machines has been installed.

YOUNGSTOWN SHEET & TUBE CO.

Completed

Campbell Works: Open-hearth department: Purchased two hot metal mixer type cars for hauling hot metal to Hubbard plant, or for replacing mixer operation when necessary. Also installed new hot metal scales. Converted former pump house into a wash house and equipped same.

Struthers Works: Merchant mill: Installed straightener for straightening flats, angles, and hexagons; drinking water system consisting of piping, cooling units, etc., and two railroad spike machines complete with charging skids. Rod and wire department: Installed two normalizing furnaces. Constructed single track railroad between Struthers plant and Campbell plant for intra-company hauling.

Indiana Harbor Works: Blooming mill: Installed four-hole battery of one-way fired soaking pits, and extended slab piler for handling 15-ft. slabs. Skelp mill: In-

Interlake brands spell *Dependability*
in Quality, analysis and delivery



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FEDERAL
P E R R Y
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All Grades

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*For Foundry, Industrial
and Domestic Uses*

INTERLAKE IRON



C O R P O R A T I O N
PLANTS CHICAGO DULUTH TOLEDO ERIE

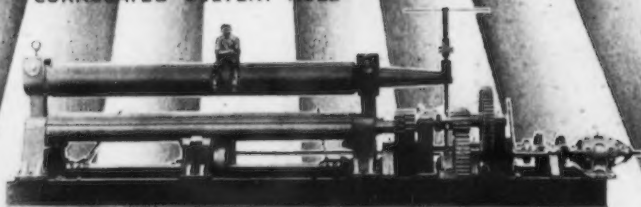
PICKANDS MATHER & CO. SALES AGENTS
CLEVELAND CHICAGO DETROIT ERIE TOLEDO MINNEAPOLIS DULUTH



SHEET METAL and PLATE-WORKING MACHINES



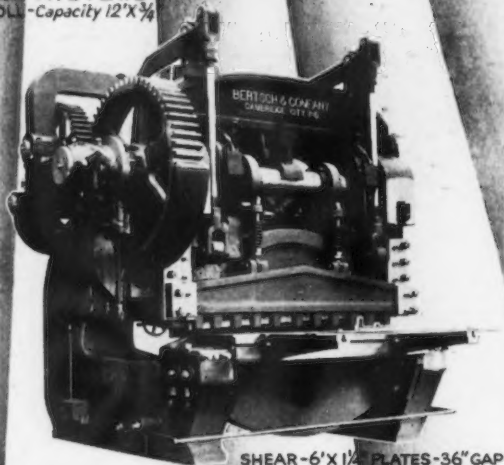
CORRUGATED CULVERT ROLL



PYRAMID TYPE PLATE BENDING ROLL Capacity 18' X 1/4"



INITIAL-PINCH TYPE PLATE BENDING ROLL Capacity 12' X 1/4"



SHEAR-6' X 1/4" PLATES-36" GAP

A complete line of heavy machinery for punching, shearing and bending sheet metal and heavy plates.

BERTSCH & CO.
CAMBRIDGE CITY INDIANA

stalled four-high reversing mill in back of 30-in. skelp mill, and equipped each side of mill for rolling hot coiled material. Merchant mills: Extended billet yard, and shipping end, and relocated chipping dock, and installed one-car type furnace for annealing alloy bars. Tin mill: Installed a cold roll department for rolling tin plate from hot coiled strip. This included extension to tin mill buildings, pickling equipment, coiling equipment, one four-high reversing mill, uncoiling equipment, cleaning equipment, shears, pilers, and one annealing furnace. Tube mill: Equipment and instruments for improving threads. Tie plate department: A complete tie plate unit with furnaces, combination punches and shears, and shop equipment was installed. The company also built and equipped metallurgical and

chemical laboratory for handling alloy steel.

South Chicago Works: Coke plant: Installed dust prevention equipment in screening station and electric precipitator for final cleaning of blast furnace gas used for under firing coke ovens.

Under Way

Campbell Works: Blooming mill: One seven-hole batter one-way fired soaking pits and one circular pit. Strip mill: Complete 79-in. hot strip mill for rolling hot strip and plates within the range of the mill; also finishing equipment for handling coiled strip and sheared breakdowns, and plate finishing equipment consisting of levellers, shears, trimmers, normalizing and pickling equipment, etc. A complete cold rolling mill consisting of

continuous pickler, one three-stand four-high tandem cold mill, two single stands four-high mills, shears, collers, levellers, pilers, trimmers and annealing equipment.

Indiana Harbor Works: Tin mill: sprinkler system for fire protection.

Other Installations

Acme Steel Co. erected a new building 575 ft. by 96 ft. and also added additional electrogalvanizing equipment.

Alan Wood Steel Co. added one annealing furnace for a 56-in. jobbing mill.

Atlantic Steel Co. installed a strip galvanizing department. This unit will galvanize six strips at a time ranging in sizes from 5/8 in. x 20 gage to 4 in. x 11 gage. It is expected that a job galvanizing department will be built in 1935. This latter unit will probably handle 20 ft. lengths of bars from 1/4 in. in diameter to 2 in. diameter, and flats and sections of about the same sizes.

Central Iron & Steel Co. installed a Smoot combustion control system, added Wing turbo-blowers on its gas producers, and placed in operation a roof temperature control and automatic reversal control on one open-hearth. It is expected in 1935, to insulate all open-hearths and mill heating furnaces, and to install roof temperature controls on the remaining open-hearths. A new engine for a 126-in. plate mill also will be installed.

Cyclops Steel Co. added two annealing furnaces of 3000-lb. capacity each.

Eastern Rolling Mill Co. placed in operation a polishing machine for stainless steel sheets.

Empire Sheet & Tin Plate Co. installed five mechanical stokers in two boiler house units, added a Streine pack shears, and built two annealing units.

Great Lakes Steel Corp. added two box annealing furnaces for sheets at the Michigan plant.

Inland Steel Co. contemplates rehabilitation of part of the old sheet mill installation at the Indiana Harbor plant.

John A. Roebling's Sons Co. installed two cylindrical, electrical, bell-type annealing furnaces and has ordered two additional furnaces of the same design for installation in 1935.

Laclede Steel Co. installed a Morgan-Conners four head wire drawing machine, and rebuilt and increased the size of 12 soaking pits. New frames for a blooming mill engine were put in place, two boilers were equipped with superheaters, and a new 10-ton crane was installed in the warehouse of the Alton plant.

Phoenix Mfg. Co. added a new boiler house.

Pittsburgh Steel Co. added a machine for fabricating highway guards, and also a pickling tank and one car-type annealing furnace at the Allenport works. It is expected that in 1935, four continuous wire drawing machines will be placed in operation.

Reading Iron Co. installed an additional heating furnace, and has a program of general repairs to the extent of \$175,000 planned for 1935.

Reeves Mfg. Co. added three annealing furnaces.

Vanadium-Alloys Steel Co. purchased new transformers and automatic electric furnace controls for two 3-ton Heroult electric furnaces.

Weirton Steel Co. completed a continuous electric cleaning and cutting installation for thin strip.

Wickwire Brothers changed all its open-hearths from producer gas to natural gas.

Wheeling Steel Corp. completed installation of a 5-stand continuous cold strip mill for the production of strip for tinning. The company also added six double box annealing furnaces, one continuous

A prompt source of supply

FOR

NICKEL SILVER →

An excellent base for silver plating, assuring a very high, natural silver finish. When exposed by wear its silvery color closely matches the surrounding plate.

Preferred for chromium plating because, among other things, no pre-plating is necessary.

Has superb drawing qualities, which are obtained quite often without the usual number of anneals.

Lends itself to the spinning of difficult shells because of its uniform ductility.

Especially suitable for etching because of its fine, even grain over complete area.

Supplied in copper-zinc alloys up to 30% nickel content, but we usually recommend 64% copper, 18% nickel and 18% zinc for most purposes.

For screw machine work, we especially recommend our 18% lead content, free-turning rod.



PHOSPHOR BRONZE →

Resists corrosion, friction and "fatigue" to a remarkable degree.

Only slightly affected by sudden rises in temperature.

Emits no spark when struck—hence offers no fire hazard.

Affords high resiliency in spring service; takes acute connection-bends readily.

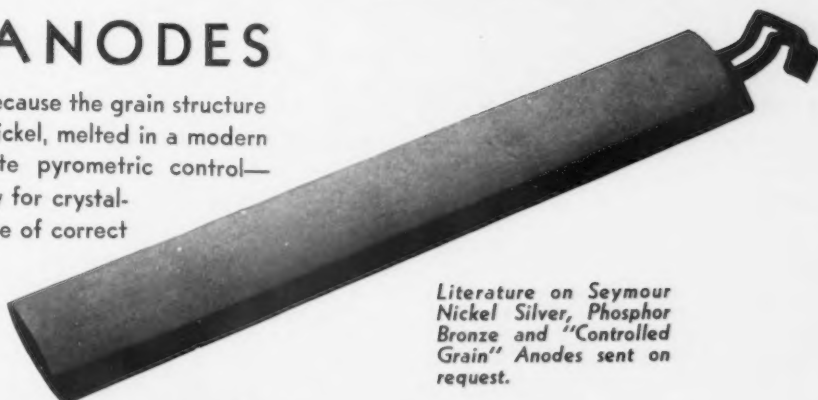
Good conductivity makes it ideal for electrical design.

Supplied in alloys up to 10% tin content, but ordinarily 95% copper, 43/4% tin and 1/4% phosphorus.



CONTROLLED GRAIN ANODES

Seymour Nickel Anodes give 100% deposit because the grain structure is homogeneous. Nothing is used but virgin nickel, melted in a modern electric furnace and poured under accurate pyrometric control—after which the mix is tested in the laboratory for crystallization. Every anode has a fine grain structure of correct analysis and will stay on the hook until complete corrosion has taken place. Seymour Controlled Grain Anodes are also made in Brass, Bronze and Zinc.



Literature on Seymour Nickel Silver, Phosphor Bronze and "Controlled Grain" Anodes sent on request.

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SEYMOUR

THE SEYMOUR MANUFACTURING CO., 24 FRANKLIN ST., SEYMOUR, CONN.

Specialists in NICKEL SILVER—PHOSPHOR BRONZE & "Controlled Grain" ANODES



THE SHENANGO FURNACE CO.

Lake Superior Iron Ores

Bessemer Non Bessemer
Aluminiferous

Shenango Pig Iron

Bessemer Basic
Malleable Foundry

SHENANGO-PENN MOLD CO.

Ingot Molds

Centrifugally Cast

Bronze Bushings



W. P. SNYDER & COMPANY

Established 1888

Iron Ore Pig Iron
Coal Coke

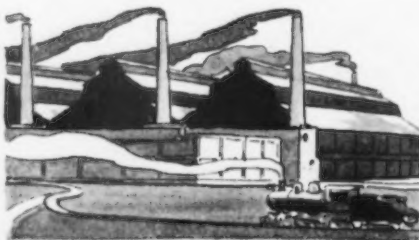
OLIVER BUILDING - PITTSBURGH

pickler and one tin mill pickler for use in connection with new mill.

Steel Foundries Add Electric Furnaces

About 250 steel foundries were in production during the year, but, with consumer demand far below the 1929 peak, there was little inducement for owners to add new capacity or equipment. Probably the most distinctive development during 1934 in this industry was the trend toward more electric melting equipment.

There were about 30 electric furnace installations during the year, including a number of small commercial and



even smaller experimental units, which have an aggregate capacity of 3300 kw. A list of installations reported to THE IRON AGE is shown in Table III. Installations which are contemplated or will be completed in 1935 are also included.

Improvements in steel foundries made during 1934 included the following: The Kay-Brunner Steel Products, Inc., Alhambra, Cal., installed one 1500-lb. Kay basic electric melting furnace with equipment and one Knapp heat-treating furnace. This company will build a new office and engineering building in 1935, is adding to its shipping room space and expects to enlarge the foundry cleaning room by 5100 sq. ft.

The Collins Co., Collinsville, Conn., purchased a 500-lb. used Moore Lectromelt furnace and plans are now under consideration for another 500-lb. electric furnace. The Duriron Co., Inc., Dayton, Ohio, has enlarged its steel foundry building and will probably purchase some new equipment in the near future.


The American Steel Foundries, Chicago, dismantled an obsolete open-hearth during the year and built in its place a 30-ton oil fired, Stevens Corpn.-design basic open-hearth. The same company expects to build another furnace of this type in 1935.

The Rogers Iron Works Co., Joplin, Mo., expects to erect a tensile testing machine in 1935, will probably build a new annealing oven, and will probably install new controls for an electric furnace now in operation.

The University of Washington, Seattle, is planning to erect two 150-lb. coke fired crucible furnaces for melting non-ferrous metals.

The United States Navy Yard, Boston, is contemplating the installation of a small melting unit of about 120-lb. capacity to operate in conjunction with the present installation of two Ajax Northrup induction furnaces.

At the Washington Navy Yard, four Ajax Electrothermic Corpn. high-frequency induction furnaces are being erected for operation in the near future. Two of these units will be nose-tilting and of 2000-lb. capacity each, and the remaining two will be of 250-lb. and 50-lb. capacity, respectively.



*"Above the Hook"
problems are solved
by the correct com-
bination of Osborn
Tramrail units.*

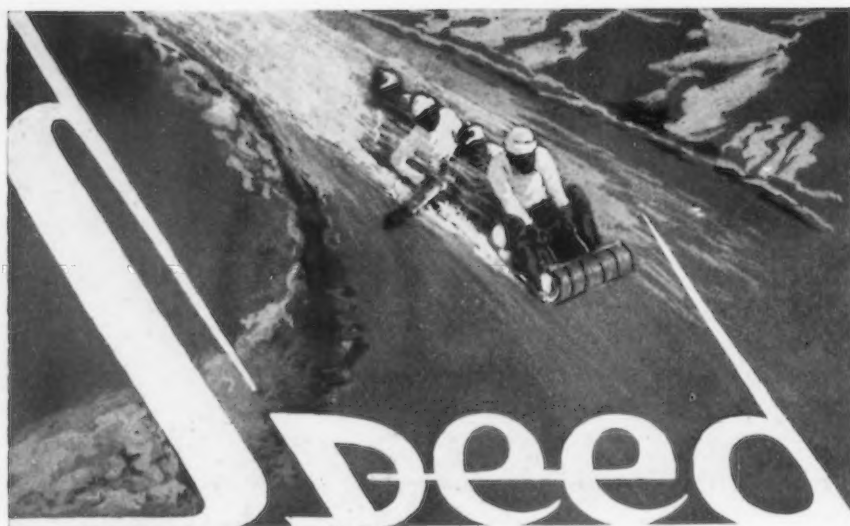
ABOVE AND BELOW THE HOOK

*"Below the Hook"
problems are solved
by the correct
Osborn - designed
Grab equipment.*

OSBORN TRAMRAIL SYSTEMS
continue to accumulate earnings
long after the equipment has
paid for the cost of installation

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THE OSBORN MANUFACTURING COMPANY • 5401 HAMILTON AVENUE • CLEVELAND, OHIO, U. S. A.



TOBOGGANING at a mile-a-minute clip down an ice-coated straightaway, then taking the hairpin turns in a dizzy whirl of snow—that is a sport packed with thrills and spills.

The greater the speed, the smoother the ride—and so it is with Ultra-Cut Steel, which machines 30% to 40% faster than most screw stocks, yet produces a clean-cut finished product with smooth surface, perfect threads and uniform quality.

You will welcome this well balanced grade of high sulphur Bessemer into your plant, as a means of speeding up your automatic screw machines and reducing your cost of production.

Ask for new folder No. 3-A which gives technical data and performance records of Ultra-Cut Steel.



ULTRA-CUT STEEL

was used to fabricate this special part $1\frac{3}{8}$ " long and $\frac{3}{4}$ " diameter with $\frac{5}{32}$ " hole drilled clear through. Made on a B & S Automatic at 239 S.F.M.—rate 90 pieces per hour. Tool life, 24 hours.

COLD DRAWN BARS
AND SHAFTING
EXTRA WIDE FLATS
SPECIAL SECTIONS
ALLOY STEELS

BLISS & LAUGHLIN, INC.

HARVEY, ILL. Sales Offices in all Principal Cities BUFFALO, N.Y.

Trend Toward Automatic Control

(CONTINUED FROM PAGE 204)

Most of the automatic regulation installed amounts to draft control—in seven out of 10 cases. In five out of 10 cases combustion control obtains, with about the same number for reversal controls. Governing operation in a way to prevent unduly high temperature of the roof is noted in two instances.

Fuel saving as a result of insula-

tion was reported as amounting all the way from 1 to 35 per cent, with a weighted average just under 10 per cent for all plants reporting on the question of savings. Data on increased life of insulated parts cover at this writing only 38 furnaces but show an average of 8.6 per cent. As to whether or not increased production can be attributed to insulation and

control, 14 per cent betterment was claimed in one instance, with a general average, including 26 furnaces for which no increase could be reported, of 3 per cent.

The view most frequently expressed regarding insulation was that it represented a saving of fuel on weekend shutdowns, a short time relatively being required to bring the furnace up to operating temperature. "It has made the open-hearth a much better place to work," says one superintendent. Another says the cost of refractories has been cut in two, with end walls lasting indefinitely. In the case of a new furnace, it is emphasized that the brick work should be allowed to settle before adding the insulation. In the early future, the results of the survey will appear in full in these columns.

Other Open-Hearth Developments

Related to controls affecting grain size is the matter of residual metals reaching the furnace through scrap charges. No little trouble has been experienced, as in off-heats of steel for strips for tin plate manufacture; surface difficulties were traced to metallic elements in amounts that would ordinarily be regarded as infinitesimal but the absence of any other variations in methods or materials tended to indicate the absolute importance of traces of foreign metal. Today's practice is shown to be more rigorous than that of even a year ago, demanding quick and close interrelation between laboratory and shop, with macro and micro studies as well as chemical and physical data constantly a part of operating procedure. The lengths to which the Timken company, for example, goes in the matter of control and inspection of quality steel production is a case in point, as was explained at length in THE IRON AGE of Sept. 6, 1934.

Among 1934 developments was the granting to K. M. Simpson (who incidentally was division administrator of the steel and other codes under NRA) of a patent for making stainless steel in the open-hearth furnace, with the expectation growing out of large scale production that costs would be reduced and a corrosion-resisting steel of a reduced price would be forthcoming. Another cost-reducing item emphasized in the year in ordinary basic open-hearth practice amounted to advocating use in the



EXIDE-IRONCLAD BATTERIES HELP TO CUT PRODUCTION COSTS

Your electric industrial trucks, operating at good speeds, handling full loads, and maintaining their service without interruption at busy moments, can help cut your production costs.

The way to get this type of performance from your units is to see that they are Exide-Ironclad equipped. In addition to their famous positive-plate construction—in which slotted rubber tubes retain the active material—Exide-Ironclads now offer an outstanding improvement.

They are equipped with the new Exide Mipor Separator, the permanent storage battery insulator, at no increase in price.

Years of field and laboratory tests have proved that Exide Mipor Separators will last the entire long life of an Exide-Ironclad Battery. They are immune to battery heat, and unaffected by vibration under the toughest operating conditions. Write for booklet, "Facts" for consideration in selecting a battery.



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IRONCLAD BATTERIES

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THE ELECTRIC STORAGE BATTERY CO., Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
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THE IRON AGE, January 3, 1935—291

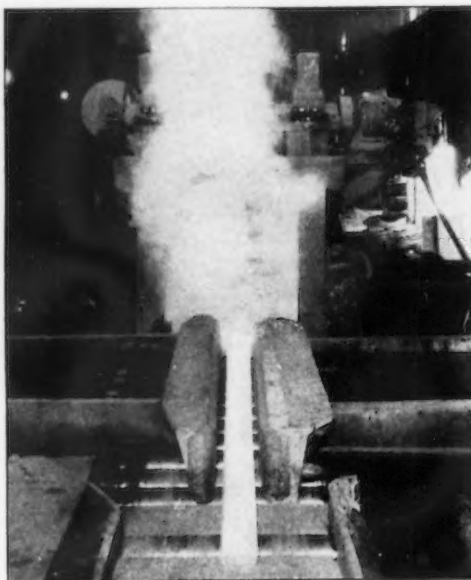
Blood lines, breeding, pedigree—these are readily distinguished in Asco Special High Grade Forging Billets.

There was a time when the quality of a forging billet was determined only after the finished forging had been in use for a period of years. If the forging gave satisfactory service, it was assumed that the forging billet was of high quality.

Blood Lines

Today, however, when you use Asco Forging Billets, you may be assured of the performance of the finished forging in advance of its use, because Asco Special High Grade Forging Billets impart to the finished forging the qualities that make for stamina, durability and longevity that are found to such a high degree in the forging billet.

This in turn means added value to your product, the **extra** quality that distinguishes your forgings from the ordinary kind. Asco Special High Grade Forging Billets are produced for forge shops like yours.



Our Metallurgical Laboratories are at your service in developing special steels for special purposes.



THE ANDREWS STEEL CO., NEWPORT, KENTUCKY

Carbon, Chrome, Chrome Molybdenum, Chrome Nickel, Chrome Vanadium,
Molybdenum, Nickel, Nickel Molybdenum, Vanadium Billets and Slabs

charge of manganese ore instead of manganese-bearing pig iron.

In Europe considerable interest was shown in an open-hearth furnace developed by the steel company at Terni, Italy. This attempts to give a character of flame suitable for each period of the steel-making process by "an improvement in the air and fuel ports so as to vary the nature and intensity of combustion."

No account of 1934 in steel would be complete without referring to the prodigious strides made in applica-

tions of the high frequency coreless induction electric furnace. It gained wide favor as shown by installations in the fields of alloy steels, including steel casting plants.

In the matter of design, including rather specific figures on proportions of furnace parts, *THE IRON AGE* presented in its issue of March 22, 1934, the views of G. W. Putnam of the Republic Steel Corp. on effective heat utilization of the open-hearth furnace. The Putnam paper discussed at some length the desirability

of automatic control of pressures and air-fuel ratios. Then in the issue of April 12, John H. Hruska took up the question of the proper relation between the area of the bath and the depth of the bath. Both articles stand as distinct contributions to the literature on steel making.

Considerable engineering data in the field of both steel making and steel rolling, largely concerning heat calculations on the basis of actual records, came to light in 1934 in the columns of *THE IRON AGE*. Among the articles may be mentioned the following: March 1, oil consumption of heating and metallurgical furnaces, by A. J. Fisher, Bethlehem Steel Co.; May 24, heat consumption of open-hearth furnaces, by R. D. Abbiss, Carnegie Steel Co.; April 12, gas consumption of plate mill furnaces under irregular operations, by E. M. Griffiths, Republic Steel Corp. Related to these compilations was one by Martin J. Conway, Lukens Steel Co., Feb. 15, tabulating the instruments, and conditions of their use, for effecting economies in the blast furnace, open-hearth and rolling mill departments.

New Processes and Equipment

Among unusual installations the new tin plate plant of the Inland Steel Co., at Indiana Harbor, Ind., stands out. Hot-rolled strip is cold rolled to No. 38 gage 36 in. wide with delivery at the rate of 700 ft. per min. Cold rolling in a Steckel mill is also provided for producing lightest weight material, and there is electrolytic cleaning of the rolled bands to remove all traces of oil and a four-high skin rolling mill to give temper to the black plate.

A Steckel mill for hot rolling (presumably employing the principle of pulling the strip back and forth between small backed-up rolls that are not of themselves positively driven, but using holding furnaces for maintaining temperature of the material as it is coiled and uncoiled each side of the stand) was installed at the McClouth plant at Detroit.

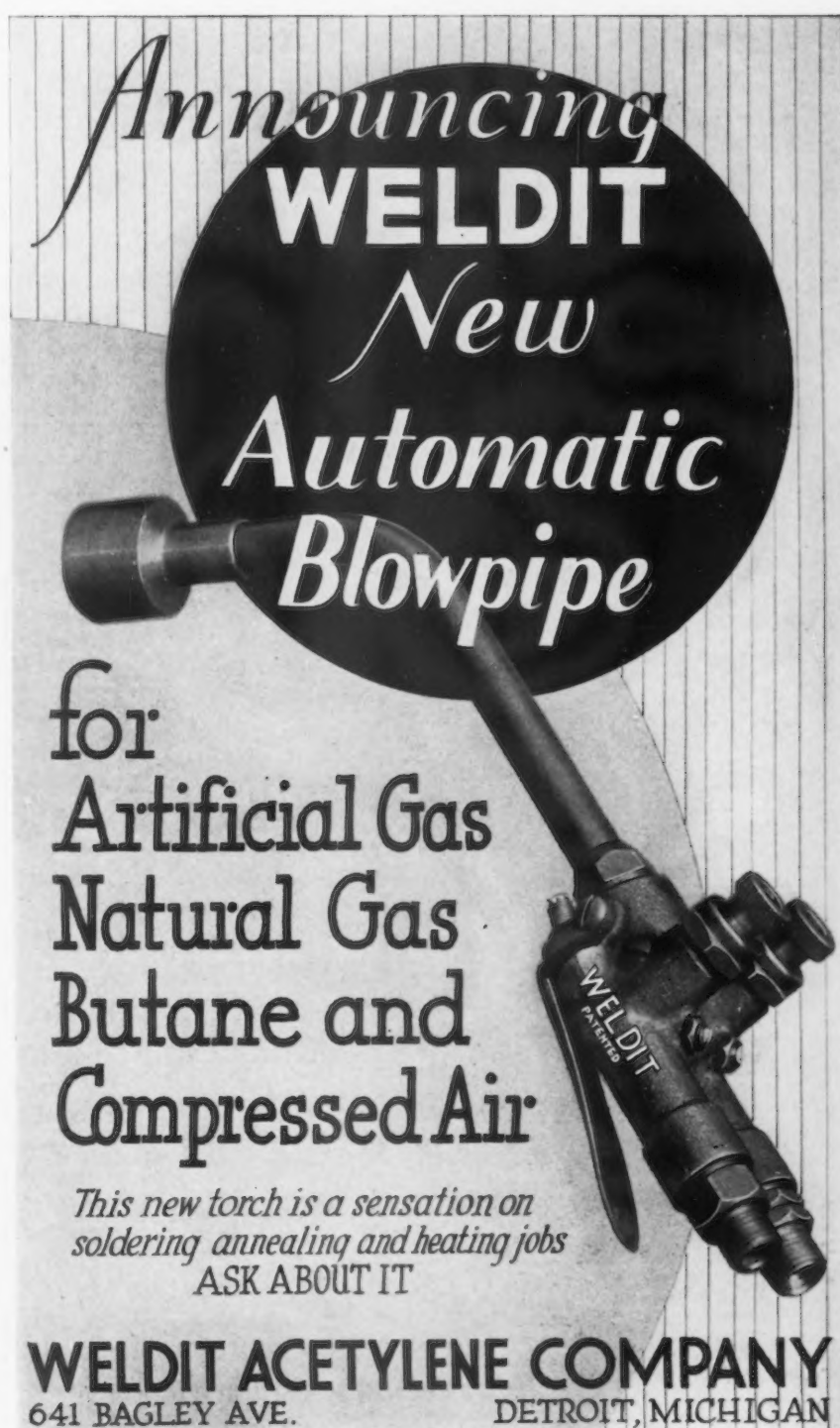
The combination system of sheet rolling, calling for mechanical roller tables at the rolling stand and continuous heating furnaces for the sheet bars and the packs, was given further impetus last year in the strong bid it is making to secure an unassailable position in the sheet industry. And, at

least two three-high mills appeared promising marked increased output per unit of time. One was a product of the Lewis Foundry & Machine Co. and the other of the Mackintosh-Hemphill Co. An installation of the latter for the Tata company in India, planned under the direction of the Perin Engineering Co., offered today's ultimate in semiautomaticity, with a production in roughing sheet bars placed in excess of 80 tons in an eight-hour shift under day-in-and-day-out operations.

For the sheet industry, other advances also can be named. A machine (Mattison) came on the market for grinding carbon as well as alloy sheets up to 48 in. in width, to give fine finishes; abrasive belts are used. A roller leveler (United) especially for flattening light gage sheets made its appearance. For box annealing the Lee Wilson company built a unit which is also the furnace; in this a set of chrome-nickel tubes are fixed integral with the cover; each is fired at the bottom by an individual burner and the products of combustion in passing through the tube bends supply the heat needed; gas or oil may be used. A high-speed continuous pickling machine through which material is passed at the rate of 40 ft. per min. was installed by a Connecticut cold-rolled strip producer; a feature of this plant is a brushing machine with revolving brushes between which the strip is run following the cold water rinse.

A new process of making seamless tubes was put into operation at the Globe tube plant at Milwaukee. This, the Foren system, rolls tubes to walls as light as No. 20 gage and up to 100 ft. in length of stainless alloys as well as soft carbon steels. A pierced billet is squeezed as a ground mandrel by five stands of rolls and then is rolled by 17 working stands so called and finally the tubing is passed through four releasing passes, these serving to produce a perfect circle and to bring the product free from the grip on the mandrel.

In rail manufacture, the practice of a Canadian rail maker got into print but only in general terms. It amounts to providing delayed cooling of the rails with the object of rendering them less liable to the development of internal fissures. Pending authentic details of the process, it may be said



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Natural Gas
Butane and
Compressed Air

*This new torch is a sensation on
soldering annealing and heating jobs*
ASK ABOUT IT

WELDIT ACETYLENE COMPANY
641 BAGLEY AVE. DETROIT, MICHIGAN

that the railroads do not yet appear willing to pay for heat treatment, although several rail producers are not unprepared to meet such a demand.

Details of a process of the Jessop Steel Co. for making tapered plates was described last year. Within the ingot an unweldable plane is inclined with regard to two opposite sides of the slab mold. The resulting slab, when rolled into an ordinary plate, gives in fact two plates of graded thickness, that is, two beveled plates.

Jolting the ingot, to localize segregation and reduce piping, has gained adherents. On top of the American method came news of German experiments which claimed to reduce grain size by jolting although sweeping commendation was withheld awaiting further investigation. Copper ingot molds were also subject of German studies, with tests to the effect that mold life is lengthened, that segregation zones are made smaller and that the surface of the ingots is improved.

Opinions Regarding Future Prospects

**Expressed As Part of an Iron Age
Survey to Be Published
Next Week**

THERE exists in the entire fabricated structural steel industry an appalling inferiority complex as to the fundamental necessity of transferring to the customer prices adequate to carry the cost. It is

the first fundamental economic axiom, that the sale price of every transaction must carry at least its full cost.

Now, there is a great deal of talk throughout the country as to the added cost of manufacture, brought about by the New Deal, and apparently we are trying to adjust ourselves to a situation where we will have nerve enough to pass this

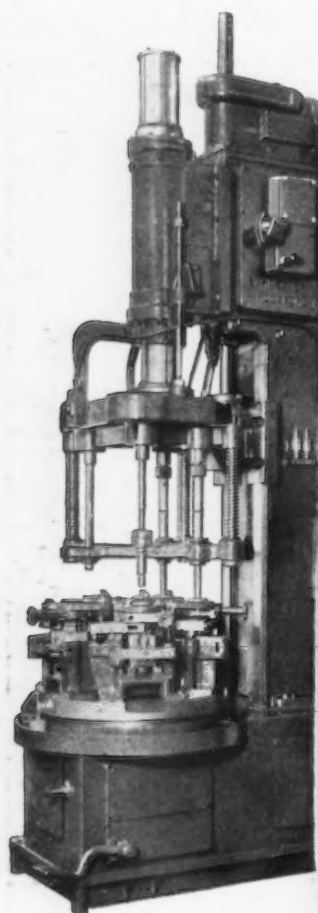
on to our customer. In the structural steel industry there are no pre-determined cost prices. A careful estimate of the cost is necessary on every transaction. It is a very simple and natural procedure to add these additional costs to our estimate and to make our price to the consumer accordingly.

The structural steel industry has had this inferiority complex for many years—long before the advent of the New Deal. Our company, for instance, never did add anything to our cost estimate for depreciation. During the past three years we have also eliminated from our cost calculations all taxes and all bond interest, on the theory that these were fixed expenses and had to be paid whether we got the order or whether we didn't. An institution might do this for two or three years and pay these items out of surplus, but there is always a time of reckoning and this practice cannot be continued much longer.

This practice of failing to include these important items of general expense (which is more or less universal throughout the industry today) has not increased our volume of business, because it is a certainty that one big, bad wolf cannot get very far ahead of the pack. Nevertheless, the above recited conditions exist almost universally throughout this industry today. The industry stands, today, paralyzed by this inferiority complex. We are struggling heroically to throw off this "jinx" but so far with no success whatever. You know that our industry has worked strenuously for 18 months past to obtain a Code of Fair Competition, which would make it mandatory for every fabricator to include his full cost in his bid. I personally believe that there is no other solution of our competitive problem.

Therefore, when anyone emphasizes this item of additional cost, brought about by the New Deal, I can only think they are working at the wrong end of the proposition. What industry needs, and especially our industry, is to come to the realization that we cannot prevail unless we come to an understanding, individually and collectively, that no element of cost can be omitted from our cost estimate and our bidding price. That is the simple and, in a way, foolish situation that confronts us. We should embrace this New Deal whole-heartedly and adjust ourselves to it, keeping ever in mind its life-saving advantages and forgetting as a major item some of the details which we imagine are mountains when in reality they are only mole-hills.

You may therefore list me as one who does not worry about the added expense on account of the New Deal, but, rather, as one who is worrying a great deal



Above: The Barnes drill, Oilgear Fluid Power Feed equipped, back of the door in the head.

NEW FLUID POWER FEEDS

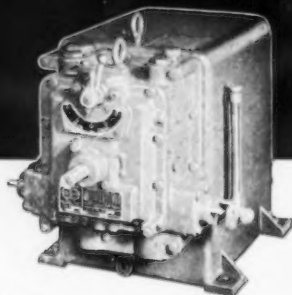
**100 to 600% More
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DESIGNERS seeking vastly improved functioning—sales departments eager for winning features—users hunting speed and economy—will get the facts now on Oilgear's revolutionary Fluid Power Feeds.

At right, a new Oilgear Fluid Power Feed. Note: Flanged mounting, as integral machine part . . . Inside pump, eliminating hazard and bettering appearance . . . Self-contained; auxiliary valves, tubing are integral with pump. Many other exclusive features. The OILGEAR Company, 11311 W. Bruce St., Milwaukee, Wis.

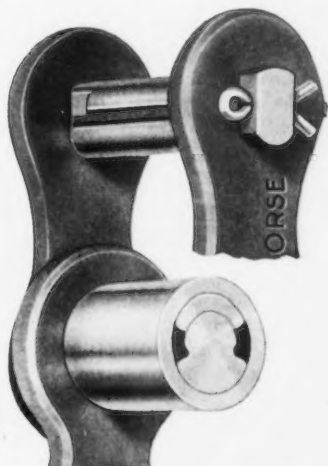


OILGEAR FLUID POWER FEEDS

(B-1201)

POWER TRANSMISSION NEWS

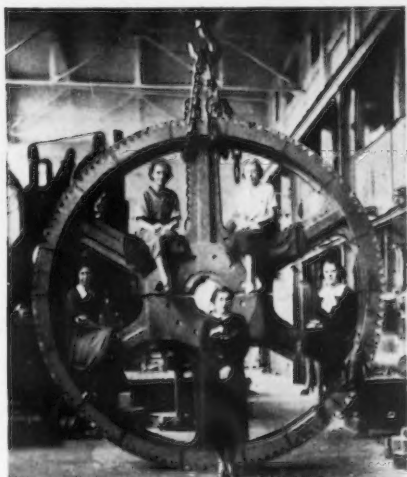
Morse 1935 calendars are now being distributed. If you haven't received your copy, write us and we will be glad to send you one of these interesting pictorial calendars.



Superior Lubrication

The fact that Morse Roller Chains last longer is due not only to superior alloy steels used, but also to the Morse exclusive design which provides for thorough lubrication inside and out.

Note in the above illustration how completely every wearing surface is lubricated. There is ample capacity, as you can see, inside every joint to assure this one hundred per cent lubrication which in turn insures smooth, trouble free performance which makes Morse Chains doubly popular.



Large Morse Drive

One of the largest diameter silent chain sprocket wheels ever made, measuring 131 inches in diameter. Casting weighed over 10 tons.

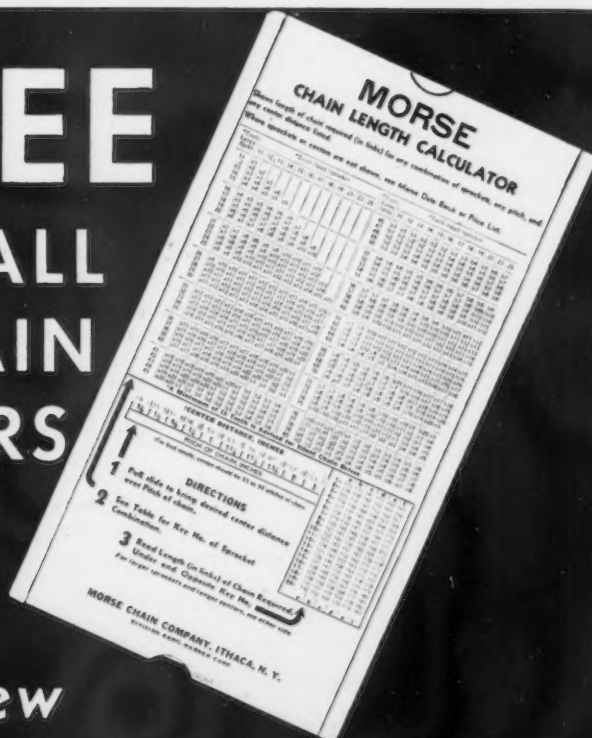
Driving rolls in a steel mill, this enormous drive replaces gears in a change over to motor drives from steam. This Morse Chain Drive transmits 1000 H. P. at 45 R. P. M.



In Use Since 1902

Since 1902, this bar stock shear has been in daily service. Here's what the shop superintendent says: "The machine was installed in 1902 and is used daily for shearing bar stock up to its capacity. The machine was purchased with the Morse Chain drive and has been giving excellent service since its installation. The chain is going strong and it is believed that it will last until it has reached the age of 40 years."

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FOR EITHER SILENT OR ROLLER CHAINS

Correct chain lengths at a glance. Here's a new and helpful calculator. Shows length of chain required for any combination of sprockets, any pitch, and any center distance listed.

You can have one of these Morse Chain Calculators by writing us on your business letterhead.

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Steel Balls for Bearings



Accurately ground, properly hardened, held to precision and commercial tolerances. Let us quote on the steel balls for your bearing assemblies. Write for free test sheet.

The ABBOTT BALL Co. 1047 New Britain Ave.
Hartford, Connecticut

about the inability of our industry to take advantage of that provision in the New Deal which is designed to prohibit the practice now flagrantly prevalent within our industry, of bidding decidedly below cost.

(From a structural steel fabricator)

Change in Washington Encouraging

WE believe there will be a considerable pick-up in business so that it will show quite perceptibly in at least the last

half of the year. All of this is based on the fact that the Administration is going to quit showing the extreme partiality it has been showing along certain lines and travel that part of the road which is made more passable for the country's general good.

As this letter is being written there are indications from Washington that there will be a decided change in the method and manner of handling the relief. Also there seems to be a feeling in our Capitol that the invested capital in this country is entitled to just as much show as labor

and we sincerely believe that if these things are handled accordingly, business will get back to normal for which we will all be duly thankful.

(From a contracting machinist)

A Common Sense Viewpoint

OUR views on the outlook for 1935 in our business, are based more upon hopes than upon facts.

A vast number of opinions have been written as to what must be done by the Government regarding the various problems which confront us. But how many have told how these problems can be solved without jeopardizing the standing of the party in power?

We could cover many pages with our opinions on our numerous difficulties, but what then? Our only hope is that the Democratic Party will do those things for the public good that should be done to hasten recovery, and disregard the political consequences. Until this is done, prosperity will remain "around the corner."

(From a tool and machinery maker)

Building Wages Out of Line

WHILE general business conditions seem to be improving despite NRA, I can see no special improvement in the demand for heating apparatus such as my company manufactures, with the exception of specifications which have been given by the U. S. Government for various housing projects. Furthermore I can see no marked revival in building in the large cities until union wage scales are cut in two and then some. Apparently the President does not realize the great obstacles to building at the present time but I am hopeful that he will finally see the light and use his influence to secure reasonable and not unreasonable compensation for building mechanics.

(A maker of heating furnaces)

Have Turned the Corner

ORDERS now on hand are sufficient to keep us quite active well into 1935, and our personal opinion is that we have definitely turned the corner toward reasonably better business.

(A builder of metal presses)

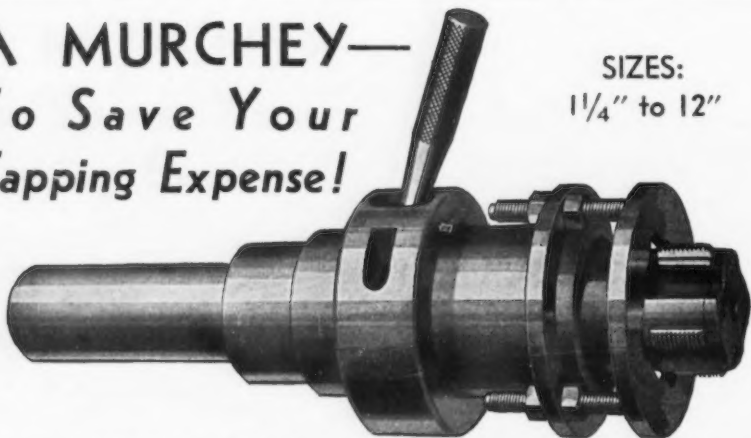
Confident of Improvement

OUR company is very largely dependent upon home building as a market for its products and as you doubtless know the home building industry had commenced to decline before 1929, until in 1933 and 1934 it was hardly 10 per cent of 1926 volume.

Apart from the favorable influence which the FHA plan for encouraging building of new homes may have, it would seem that any improvement in general business would be reflected in home building, considering the long

A MURCHEY— To Save Your Tapping Expense!

SIZES:
1 1/4" to 12"



If you are using solid taps you have a profitable opportunity to reduce your tapping costs with the new Murchey Collapsible Tap.

You can perhaps visualize the time saved by this tap over your solid taps, and the following features assure you of high production free from tap troubles:

1. Chasers move in hardened slots.

2. Chasers collapse positively by cam and rollers.

3. Chasers quickly removed for grinding and quickly reset without removing cap.

4. Tap can be used for stationary and rotating tapping.

Let us tell you what Murchey Collapsible Taps are doing in other plants.

MURCHEY MACHINE & TOOL CO.,

951 Porter St.
Detroit, Mich.

period of years during which this type of construction has declined to almost nothing.

We are hopeful that the upward trend in general business will continue throughout 1935 and, if it does, we are confident of improved conditions in our line.

(From a maker of steel building products)

Prospects Good Despite NRA

AT the present time we have contracts closed greatly in excess of our contracts at this time last year and we anticipate a volume of business for 1935 that will equal our volume for 1930 or possibly exceed it.

We have found competition very keen and prices far from satisfactory, in fact we can see no advantages that have come in the stabilization of prices through NRA.

(A steel product manufacturer)

Only Clouds Are Political Ones

REGARDING your inquiry as to our views on the outlook for 1935 as related to our business, we are hoping for a better year next year, principally based on the fact that our business has shown a continual improvement for the past nine months and we have every hope that it will continue. The only real cloud we can see on the horizon is the political situation and if our politicians at Washington can just be reasonable for a while, I am sure we will all be more optimistic for the future.

(From a maker of air compressors)

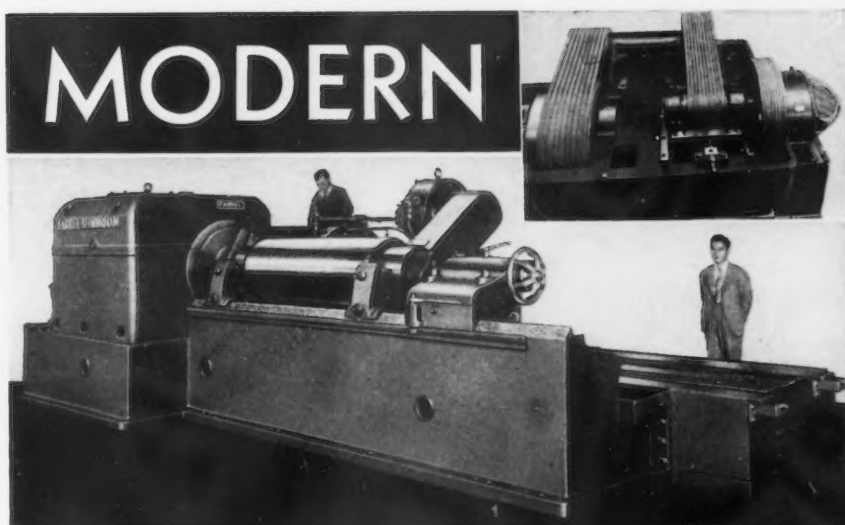
Hopes for Steel Pick Up; So Do We!

YOU asked for an expression of my views as to the outlook for the early part of 1935 as relating to our lines of business. At the present time it appears rather difficult to forecast the early months of next year. Our business is distinctly a jobbing one and our products are almost entirely repair parts or maintenance items from the standpoint of our customers. For some years, approximately half of our sales in normal times have been to the steel industry. While that industry was fairly busy during the first half of this year our volume of business was relatively quite good but, beginning with the first of September, our volume of new business has fallen off very decidedly. If there should be any decided pick-up in the steel business within the next few months, as I hope, then I expect to see our business materially increase.

(From a maker of gears and pinions)

Better Business Sentiment Is Encouraging

IT is difficult to prophesy for the future, but after analyzing the present situation, the past operations for the last fifteen months, and also learning that the



..... in design and performance

The very appearance of this new Farrel Heavy Duty Roll Grinder suggests that it is capable of meeting the most exacting requirements of modern rolling mill practice. And this expectation is fully realized in its performance.

In one steel mill, rolls that formerly required five to six hours are now being finished in two hours, with a perfect surface free from marks of any kind. In this plant they are getting results in improved quality and increased output that they had thought could never be attained on any roll grinder. Similar results are being obtained by other users of Farrel Roll Grinders.

The major improvement responsible for this remarkably better performance is the multiple "V" belt driven headstock shown in the insert above. This completely eliminates the vibrations inherent in even the most accurate and carefully mounted gear-driven headstocks, making possible a higher degree of accuracy and a finer finish in a shorter time.

We should like to tell you more about this and other details of design which contribute to the speed, precision, convenience and economy of operation of Farrel Heavy Duty Roll Grinders.

A consultation with our engineers will involve no obligation.

FARREL-BIRMINGHAM COMPANY, INC. 100 Main St., Ansonia, Conn.

cash income of the agricultural department of our Government has increased from 15 per cent to 20 per cent over the same period of a year ago, and also that the President of our country is in favor of the beginning of dwindling of the relief expense, we cannot help but feel that not only the fore part of 1935 will mean a volume in business equal to the best part of 1934, but will also continue practically throughout the year of 1935, unless the business be a seasonable enterprise. We also firmly believe, even though the volume may not be larger for 1935 than it has for 1934, it will be more stabilized and the industrialists will feel quieted and resolute about their businesses.


Naturally we may be a little more opti-

mistic than those of other industries because the glass industry and its allies have not been depressed to the extent that many of the others have, as there has been no time that we have not operated at least 65 per cent of normal operations.

(A manufacturer of glass molds)

Price Rises Upset the Apple Cart

WE are optimistic as to the outlook for the early part of 1935 and beyond, now that industry as a whole has apparently decided to cooperate with the Government on the New Deal policy.



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Rectangular - Square - Keystone
Untempered - Tempered

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insures uniform quality.*

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NEW ENGLAND HIGH-CARBON WIRE CO.

MILLBURY, MASS.

It is our sincere belief that were it not for the short-sightedness of business men in general, in advancing prices as was done during the third or fourth quarter of 1933, we would have been over the depression by this time. During the latter half of 1933, there was quite an increase in volume in all lines, and this increase in volume reduced overhead considerably more than the increase due to increased wages, and an opportunity was at hand to turn overhead expense into profits.

The price increases, however, discour-

aged buying in all lines, and, as a consequence, we slumped back into a position that has since been difficult to get out of. There is no one to blame for this but the average American business man.

You will note from the questionnaire which we filled in that our cost increased but very little over the second quarter of 1933. Although our direct labor cost increased, were it not for the fact that we were required to pay more for materials which we purchased, we would have been in position to lower our prices instead of maintaining them on approximately the

same basis as our second quarter of 1933 prices. We have not advanced prices, and with a possible exception, a few specific industries' price advances were not warranted.

Further, commenting on a permanent national recovery program, it is absolutely essential for the Government to regulate wages on a minimum basis of 40 hours per week, but with the privilege of additional working hours with increased compensation for the extra time, for it is our belief that in many localities, especially in the smaller localities, there will be no excess of labor within a comparatively short time, assuming, of course, that business is not again going to upset the apple cart. We are positively against price fixing or anything that would prevent free competition. We believe that the present rules of fair competition of the Federal Trade Commission, are sufficient to take care of really unfair competition, especially so when there is Government regulation of wages.

(From a maker of washing machines)

Prospects Dark for Nails and Brads

WE can see no prospect of a brighter outlook early in 1935 on nails and brads, as the established selling prices are below cost of production, hence we lost money on our operations since 1930 and are still continuing to lose money.

(From a maker of nails and brads)

Recovery Depends Upon Change in Govern- ment Attitude

THE outlook for the early part of 1935 will depend very largely upon the situation that develops in the durable goods industries of which we are a component part, and upon which we depend largely for our patronage. The attitude of the New Deal toward this phase of recovery has been most destructive and until such time as the majority of people in this country realize that prosperity depends upon profits, there will be little encouragement for those who might invest in these industries to release their funds for the development of this phase of recovery.

There has been entirely too much theory and not enough practical application. The burden of taxation which will be levied upon industry in the next few years particularly (and probably for the next 25 to 50 years) will retard progress unless there is something said by the Administration in Washington that will clarify these conditions. The voters have nobody to blame but themselves for these conditions. The men who have handled these affairs have been elected by the voters of this country and until such time as an educational program is carried on to show them the utter impossibility of this program enjoying any degree of success, we will be faced with the same situation.

Private capital which must be invested

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profits in 1935*



Let HENRY & WRIGHT reduce your stamping costs. DIEING MACHINES produce intricate stamped parts complete in one stroke, thus eliminating many operations. High speed production, perfect product, automatic operation and long die life result in stamping profits.

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Dieing Machines — Steel Presses — Automatic Presses

The HENRY & WRIGHT Mfg. Co.

Hartford

Connecticut

in the durable goods industries is not and will not be available so long as the present policy continues. The amount of money that has been taken out of circulation and hidden in safety deposit boxes no doubt equals a sum far beyond our imagination. When this currency is flowing, prosperity prevails; when it is taken out of circulation, business becomes stagnant. The policy of "soak the rich" will never thaw out this frozen condition and until investors can realize that there is a possible chance for profit, the volume of investment will be exceedingly small and the operations of the durable goods industries will be curtailed.

If this situation were changed today and the Administration should give dependable cooperation and not evasive high-sounding, meaningless expressions, it would require from three to six months for the program to get under way. You have carefully read the statements of the President to the Bankers Association meeting in Washington and you can readily appreciate the almost exact opposite statements that have been made on his trip through Tennessee and Kentucky shortly after. What the country needs is a policy that will encourage confidence and so long as the Administration tries to thrive on both sides of the fence, little, if any, progress will be made.

What will happen in the next session of Congress is beyond the most fertile imagination of any citizen today. A Democratic Congress was elected four years ago to end the depression and a Democratic Executive was elected two years ago to reduce the cost of Federal Government 25 per cent; neither has been approached, much less accomplished.

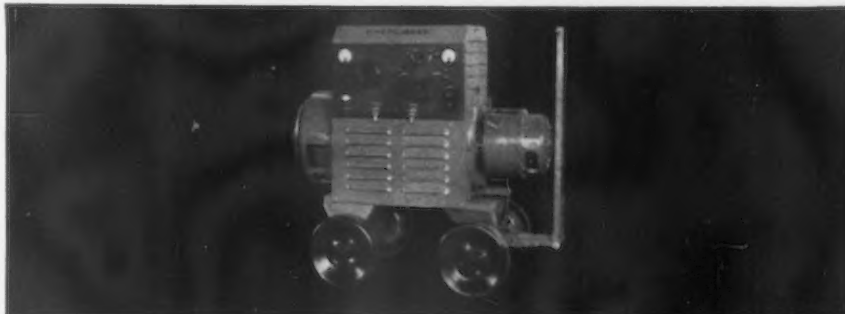
Nineteen hundred and thirty-five, on an average all along the line, will be little, if any, better than 1934. If the Administration would say to business that we are through with these noble experiments and we are going to give you the kind of cooperation that will help you recover, and then have the courage to stand by its statements, you would see a revival that would surprise even the most skeptical. Without it, I would hesitate to make a guess what the answer will be at the end of the first quarter of 1935. It is my personal opinion that there will be more failures in business between December 1, 1934, and March 1, 1935, than in any similar period in our history. That is a pretty serious situation, and there is only one thing that can save it, and it is very doubtful about that, and that is a definite policy of the Administration that will benefit the durable goods industries. Without their progress, little, if any, prosperity may be expected.

(From a spring and wire manufacturer)

Despite Drawbacks, Possibilities Are Bright

IN our opinion there is plenty of capital available at this time for all legitimate business houses, without Federal loans to industry, but industry itself is so filled with uncertainty and doubt continually,

ACCEPTED



for every welding job

Whether it is in the tank shop or in the oil field—in the machine shop or for maintenance, in the structural field or for plate fabrication, the UNIVERSAL ARC WELDER has gained remarkable acceptance among the largest plants in the country.

The UNIVERSAL ARC WELDER will do as much in your shop. Easy, economical operation, producing perfect welds are the qualities that have won new friends everywhere.

Let us tell you about it.

UNIVERSAL ARC WELDERS

UNIVERSAL POWER CORPORATION
CLARKSTONE ROAD CLEVELAND, OHIO

because of the contradictory statements emanating from Washington, that a great hesitation appears in every direction, even though business would like to expand.

Our principal customers are townships and counties, all of whom actually need equipment to work efficiently, but the Federal Government has urged so strongly the employment of hand labor to the exclusion of machinery, that most township and county officials are afraid to spend money in this direction, no matter how badly needed, because of public criticism.

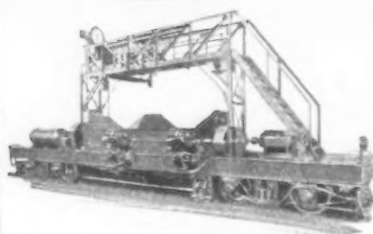
We are finding, however, that the average property owner in most sections,

because of the inefficiency of hand labor in the direction of public works, and the large waste of moneys, is gradually realizing that in order to obtain value for the money expended, proper machinery must be used as this does not replace hand labor necessarily, but simply supplements hand labor, to offer a greater permanent value for the money used.

There are several reasons right now contributing to the delay in buying necessary equipment:

1. Inability in a great many localities to collect taxes.
2. Government competition in certain industries.

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Double Compartment Scale Car with Overhead Operator's Platform. Car provided with 30' Bin Gate Operating Mechanism.



20 Ton Capacity Double Compartment Scale Car for use with 30' type Bin Gates, controlled from Operator's Station on Scale Car.

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Increasing numbers of shops and plants are standardizing on ARMSTRONG Drop Forged WRENCHES for they find in them the same outstanding superiority, the extra strength, quality and "tool sense" in design that marks ARMSTRONG TOOL HOLDERS.

ARMSTRONG WRENCHES come in over 50 types—drop forged from special carbon or Chrome-Vanadium Steel in all sizes from tiny miniatures to great 2-man wrenches, Socket Wrenches of all kinds; special wrenches . . . wrenches for every possible need. Wrenches that stand up under all manner of abuse and cut tool costs.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"

309 N. Francisco Ave., CHICAGO, U. S. A.
New York Sales Office: 109 Lafayette Street

3. Excessive regulation through codes, preventing the normal purchase of machinery.

Notwithstanding the drawbacks which we have outlined, it is our opinion that the possibility for increased business is growing every day, and that the outlook for the early part of 1935 is considerably better than it has been, provided the Federal Government continues in its apparent present desire to encourage private industry with less regulation.

(From a builder of road making machinery)

Volume Has Not Yet Overcome Cost Increase

WE estimate our inventory today as about what it was at the beginning of the second quarter of 1933, and assuming this as an index figure and assembling data of all the quarters since then and including the third quarter of 1934, we come to the following summary: Our wage increase has been about 30 per cent. The cost of materials and overhead, which also includes wages paid, show an increase of about 68 per cent. The sales increase over the same period shows an increase of about 72 per cent.

From this you will note that there hasn't been any large benefit to us because of the New Deal. If there had been a considerable increase in sales, benefit would have accrued to us as costs would not have proportionately increased. The facts remain that as costs and overhead increase, we haven't been able to much more than cover such with the sales increase. You must bear in mind that there are quite a few items such as taxes, commissions, bad debts,

etc., etc., which would increase at the end of the year our overhead costs and finally mean that any sales increase has been at least balanced by increase in costs and overhead.

(From a manufacturer of transmission equipment)

Believes Changed Administrative Attitude Will Help

WE are hopeful that during the next few months we may find a further indication of the Administration changing its attitude which will restore confidence and enable us to realize in 1935 a year that will be more acceptable than any that we have had since 1929. With proper cooperation between Government and business, we should find this not only possible but a reality.

(From a maker of grinding and separating machinery)

Inquiries Are Encouraging

OUR business is principally conducted with industrial plants, the volume of which normally is low in the first three or four months of the year. Being a part of the capital goods industry, we have suffered severely in a reduction in the volume of our business. It is encouraging, however, to note that although our volume is still small in 1934, it will probably be 100 per cent in excess of the year 1933.

We find that industry in many different lines is interested today in revamping old construction and new projects. The improvement in the quantity of inquiries

Can you afford not to

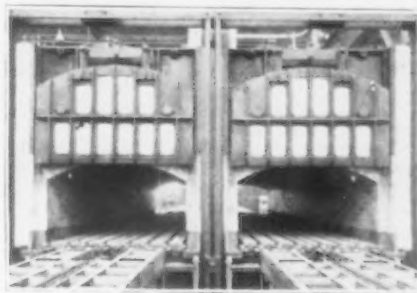
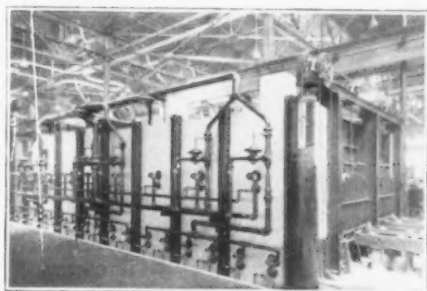
- (1) Increase Your Production
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- (5) Greatly Increase Efficiency

BY USING

"ALUMITE" RI-43 (Refractory Insulating Brick)

Modern competition can not be met with slow, heavy, inefficient furnaces, lined with heavy, heat absorbing fire brick.

"ALUMITE" RI-43 (Refractory Insulating) brick are not an experiment, backed only by theories and laboratory data but have been used by the millions by our largest metallurgical and other industries, in this country and abroad, over a period of years. We have pioneered the development of this new, superior type of refractory material and our Engineering Dept. has had experience in its application to practically every type of furnace.



Annealing Furnaces Constructed with "RI-43" brick in 1929 by a large Copper Concern and continuing to operate efficiently today. Bottom view shows burner arrangement.

High Aluminous
Sillimanite
Fused Alumina
Silicon Carbide

Annealing Muffles & Lehrs
Tunnel Kiln Car Top & Refractories
Smelters & Crucibles
Special Shapes of Every Description
Refractory Cements & Plastics

Periclase
Zirconia
Zircon
Beryllia

The MASSILLON REFRACTORIES CO.

Founded by W. G. Hipp

On the Lincoln Highway

Massillon, Ohio

Convenient for Truck Delivery

during recent months is the most encouraging sign that we have as to the future.

(From a manufacturer of structural steel)

Expects Large Increase

OUR volume of business has increased and we expect a much greater advance in the year of 1935.

(From a manufacturer of builders' hardware)

Looks for Gradual Increase in Volume

OUR opinion as to the outlook for the early part of 1935 as related to our business is that we will experience a slow but gradually increasing volume.

(From a maker of pig iron)

Makes Proviso of Capital Assurance

YOU ask us to express, for publication, our views for the outlook for the early part of 1935 as related to our lines of business, and will say that we are not looking forward with much optimism toward 1935 as being very much better than what we have been going through

this past year. Our reason for thinking so is that until capital has the assurance of its just reward or just wages we are not going to have much of any improvement in business. Reference is made particularly to the capital goods industries.

(From a builder of drilling and boring machines)

Bright Prospects for 1935

AS to my outlook for the year 1935, everything looks very encouraging. Nineteen hundred and thirty-four was a big improvement over 1933, and from present indications I think 1935 will show a steady improvement over 1934.

(From a consultant in galvanizing processes)

New Deal Has Helped

I WOULD say that there is very little question but that the New Deal has added to our cost. Like many others we have held our prices in spite of increased cost of materials, but sooner or later we must advance proportionately. This will amount to something over our previous highs as we are now paying about 6 per cent more for castings than previously. Some items of staple requirements have increased in advance of any previous price we had to pay. I understand from others

using the same grades that they too are paying more.

To get down to a reasonable estimated percentage we probably are paying a unit cost of from 6 to 10 per cent more than in 1932, without any labor increase, as we never cut our wages at any time during the depression.

To be fair, we are compelled to admit that we have been helped in some respects by the New Deal. The practical elimination of certain unfair practices has helped the smaller company a great deal. On the other hand, it has been a drawback, particularly as regards limitation of hours and in some other similar respects.

This letter probably will give you a little idea of how it affects a real small company, and if it helps, we are only too pleased to have commented.

(From a maker of tumbling barrels)

Does Not Expect Marked Increase

WE are experiencing a slight increase in business at the present time and are hoping and expecting this will increase gradually for at least the next few months, but are not expecting any marked increase during above referred to period.

(From a maker of malleable iron and other castings)

HERE IS THE MODERN
GRINDER PUMP TO END
YOUR COOLANT TROUBLES—

GUSHER

**DIRECT MOTOR DRIVEN
BALL BEARING PUMP**

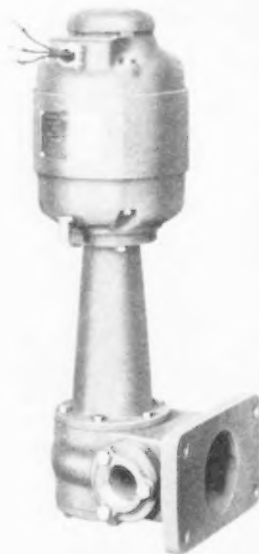
Eight months ago, we furnished a GUSHER PUMP for a glass grinding machine. This PUMP has been in constant use—16 hours per day—and has not been serviced.

Before the GUSHER PUMP was installed, it was necessary for *them to replace the old pump every six weeks.

It may be to your advantage to replace some of your old pumps with new Gusher Coolant Pumps.

*We will gladly give the name upon request.

The Ruthman Machinery Co.
201-11 Pike St., Cincinnati, Ohio



Patented and
Patents Pending.

The Outlook for 1935 In the Electrical Industry

By GERARD SWOPE

President, General Electric Co.

THE volume of electrical manufacturing business during 1934 has been more than 30 per cent greater than in 1933. Consumption of electricity throughout the United States has been approximately 7 per cent greater than in 1933 and is almost up to the maximum consumption in

the years 1929 and 1930. This increase has been due largely to the increased use of electrical appliances in the home.

The electrical manufacturing industry, and industry in general, has felt most seriously the failure of the revival of orders for capital goods,

but with the increased use of electricity and consumers' goods in general, capital goods must also increase.

For the year 1935 we look forward to a continued improvement in business.

Germany Uses 500,000 Tons of Rustless Steels

THE consumption of corrosion resisting steels is mounting rapidly in Germany. Specially treated copper bearing steels are particularly favored, as steels of the high chrome-nickel type, such as 18-8, are at some disadvantage due to their comparatively high cost.

Although plain copper bearing steels are the cheapest, they are not the best sellers. The largest tonnages consist of copper-chrome grades (0.5-0.75 Cr, 0.25-0.50 Cu), which are sold at an extra of 10 to 12 per cent above the price of ordinary carbon steels.

Around 14,000 tons of copper-chrome steel has been used in the large bridge connecting Jütland and the Isle of Fünen. Also a new highway, which is being built with amazing speed in Germany, includes more than 260 small and large bridges built of this material. And two new bridges across the Rhine and two across the Elbe will absorb nearly 20,000 tons of copper-chrome steel. This material generally has a tensile strength of 75,000 lb. per sq. in.

A considerable amount of wire netting, sheets, and barbed wire are also made from copper-chrome steel, for which a corrosion resistance 100 per cent superior to carbon steel is claimed.

Exact figures as to the volume of German sales are not yet available. However, it is estimated that the total for 1934 will be around 500,000 metric tons for all grades, including the high chrome-nickel type and the copper-chrome types. This is far more tonnage than was sold by all other European countries combined, including Russia. Only in France is the sale of similar steels making comparable headway.

It is estimated that the steel plants of the United States use 2000 tons of copper annually for alloying iron and steel. For the same use, the consumption in Germany amounts to about 500 tons each year.

• DROP • FORGINGS

AUTOMOTIVE AND INDUSTRIAL

There are plenty of good alloys on the market today, and making good drop forgings from them is a job we have mastered at Auburn.

We are prepared to heat treat these forgings to bring out their superior qualities, and to machine and polish them, if required.

We offer to you a quality and service developed as a result of 71 years' experience in the drop forging business.

THE E. D. CLAPP MFG. CO.
86 COLUMBUS AVE. AUBURN, N. Y.

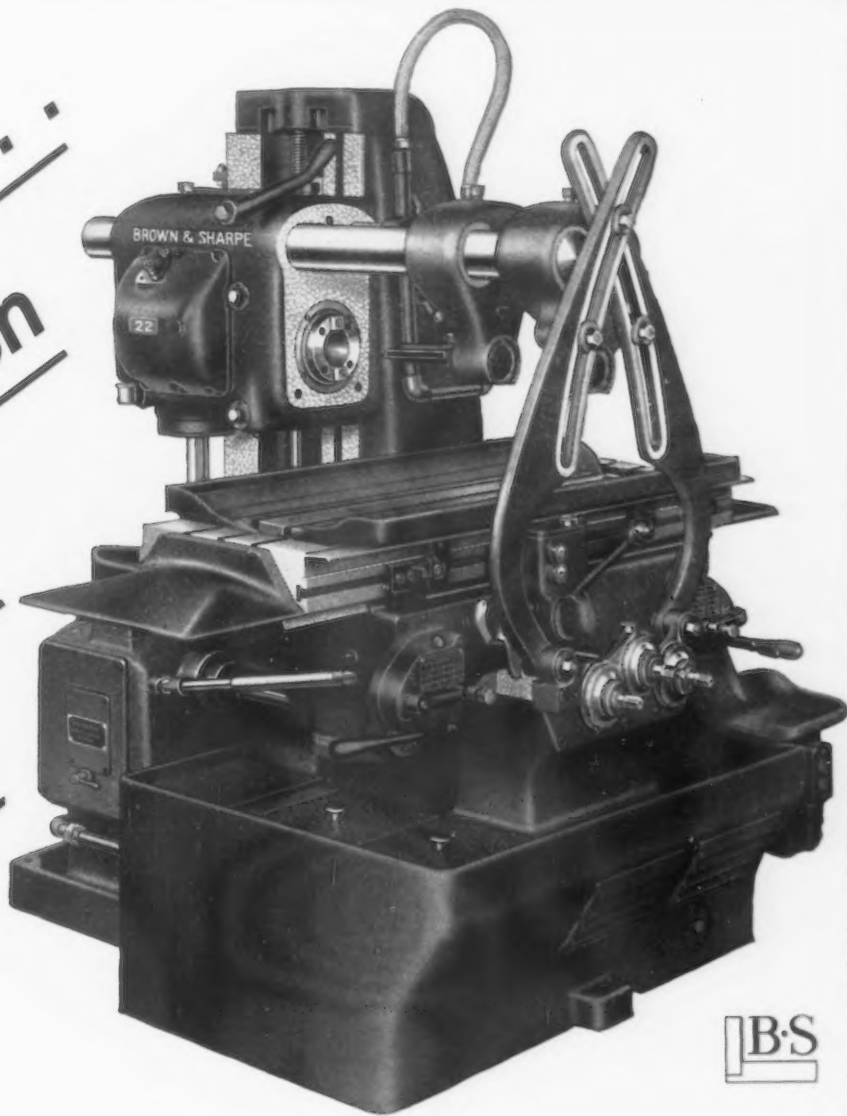
Branch Offices
306 Dime Bank Bldg.
Detroit

1324 Chestnut St.
Philadelphia

1864--1935

**NICKEL STEEL
CHROME NICKEL
VANADIUM, TOOL
OPEN HEARTH
BESSEMER STEEL
BRASS, COPPER**

No. 22
A Production
Leader
for 1935



BS

It gives—The Flexibility of Control of the "Column and Knee Design"
(quick set-ups—reduction in non-productive time)

Combined with—The Production Advantages of the "Bed Type
Milling Machine"
(unusual rigidity—high production with accuracy)

.... An economical investment for both
short and long run production jobs

Investigate its advantages—Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.

BROWN & SHARPE
No. 22 PLAIN MILLING MACHINE

RACKETEERS OF WASTE



The Cards are
stacked against you . . .

when you take chances on Sheet Metal!

It's fatal to think that "any sheet metal will do." Wear, Weather and Corrosion make short work of the sheet metal bought on that basis. You can be sure these three racketeers of waste will take no toll from you when you use GOHI Pure Iron-Copper Alloy, the one sheet metal that can be depended upon under the most destructive conditions.

GOHI offers unusual resistance to wear, weather and corrosion. It is the same fine metal that is used throughout the land for drainage structures, where GOHI has service records of more than a quarter of a century of unflinching satisfaction—and still on the job!

For every sheet metal need GOHI is the longest-lived, low-cost ferrous metal you can buy. Samples will be sent on request.

GOHI
PRONOUNCED "GO-HIGH"
SHEET METAL
THE NEWPORT ROLLING MILL COMPANY . . . NEWPORT, KENTUCKY

GOHI Pure Iron-Copper Alloy is available in all sizes and gauges. Produced exclusively by The Newport Rolling Mill Co., Newport, Ky.

Sees Great Opportunity for President Leadership

THE outlook for the early part of 1935, judging from available information, and as relating to our particular line of business, is that there is no foundation upon which to assume that business will be any better in the immediate future than it has been for the past year unless something is done to create a demand for our products from other durable goods industries. We cannot hope to enjoy any degree of prosperity (being classed as a durable goods industry) unless our class,

as a whole, is enjoying prosperity. In order to create this condition many things must be done, and the main thing, in my opinion, is to restore confidence as too many uncertainties exist today which keep capital in no state of mind where money will flow back into channels to create even a semblance of prosperity.

I can truthfully state, that I believe President Roosevelt has one of the greatest opportunities ever offered any President of our great country to so weave

himself into the confidence and respect of all classes of citizens that his name would go down to posterity as one of the greatest presidents the country has ever had.

To do this it is necessary to get labor back to work and also capital. Why cannot labor and capital have formed for them a truce, extending at least over a period of one year and during this time industry cannot reduce wages, neither can labor strike? Commodity prices during this time to be controlled.

Why cannot the President use his endeavors to stabilize the dollar?

Why cannot the budget be balanced, at some predetermined time providing industry absorbs the unemployment existing today and also absorbs the employment now being used on PWA and FERA projects?

Why cannot the NRA be abolished except in so far as it pertains to important social reforms, such as minimum wage, elimination of child labor and sweatshops, also elimination of cut-throat competition?

Why cannot the President promise that consideration will be given to the question of taxes and use his best endeavors towards economy in Government expenditures, at least until the Government can, like the individual, afford to spend when money is coming in?

Why cannot the President make it possible for industry, through the RFC, to borrow on long terms and reasonable security sufficient money so that 90 per cent of the smaller industries whose working capital is depleted can put themselves in position to resume operations again? Many of the smaller industries today will not be able to again function at a profit unless they can get a material adjustment on their present indebtedness and this adjustment can be made at this time on a cash settlement, but today the RFC will not loan money, or at least to any great extent for the payment of debts.

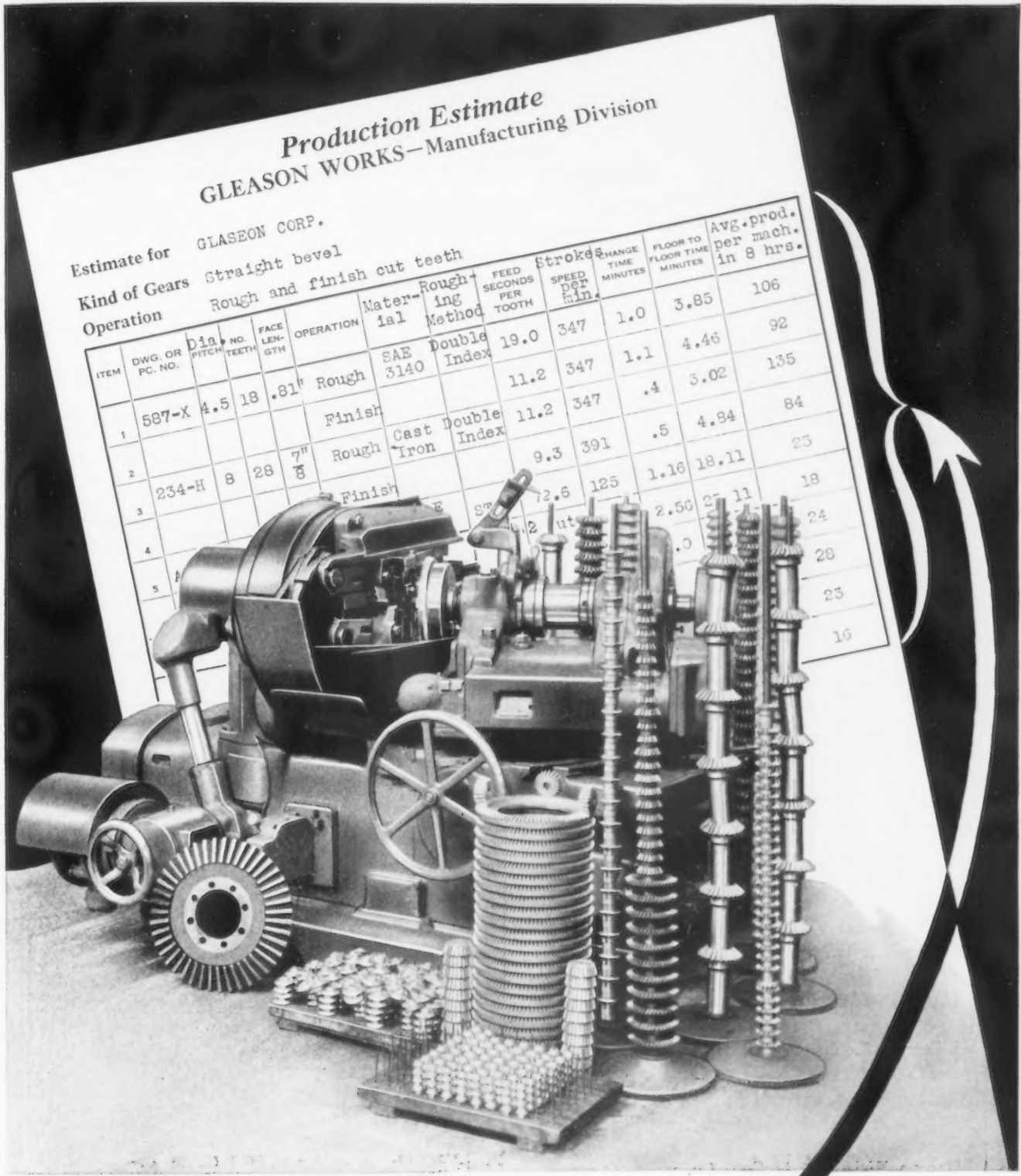
Why should the RFC draw the line at loaning money for payment of debts if debts can be paid now at a saving and which would be the means of that particular industry to again become one which pays an income tax to the Government and puts men back to work? All money loaned to industry, if loaned on good security, will be repaid and helping industry back on its feet means more men off of Government relief.

Why cannot the Security Act be corrected so that legitimate financing can be resumed?

We needed reform and it seems that this has been accomplished and what we need now is recovery, and this, in my judgment, can only be obtained by creating in the minds of all a feeling of confidence.

Our country cannot prosper without labor. Neither can it prosper without capital. Labor wants to get back to work, so does capital. Labor cannot get back until capital furnishes the means. Confidence can do this and the President can provide the means for creating confidence. I believe he will.

(From a steel fabricator)



Production Estimate GLEASON WORKS—Manufacturing Division

Estimate for
Kind of Gears
Operation

GLEASON CORP.													
Kind of Gears		Straight bevel											
Operation		Rough and finish cut teeth											
ITEM	DWG. OR PC. NO.	Dia. PITCH	NO. TEETH	FACE LENGTH	OPERATION	Material	Roughing Method	FEED SECONDS PER TOOTH	SPEED PER MIN.	Strokes	CHANGE TIME MINUTES	FLOOR TO FLOOR TIME MINUTES	Avg. prod. per mach. in 8 hrs.
1	587-X	4.5	18	.81"	Rough	SAE 3140	Double Index	19.0	347	1.0	3.85	106	
					Finish			11.2	347	1.1	4.46	92	
2													
3	234-H	8	28	7"	Rough	Cast Iron	Double Index	11.2	347	.4	3.02	135	
					Finish			9.3	391	.5	4.84	84	
4								12.6	125	1.16	18.11	23	
5								2.56	25	11	18	24	
													28
													23
													16

*The Proof of
it's Ability*

12" Straight
Bevel Gear Generator

CAPACITY

24" pitch diameter, 10 to 1 ratio,
3 diametral pitch, 3 1/2" face.

GLEASON WORKS, ROCHESTER, N. Y., U. S. A.

SINCE 1875 GLEASON HAS CONTINUOUSLY CONCENTRATED ON BEVEL GEAR MACHINERY

BLANCHARD GRINDING

should be considered for any unobstructed flat surface requiring better finish or accuracy than would result from a roughing cut.

Are you making full use of Blanchard Grinding for machining and finishing flat surfaces?

Blanchard Grinding is in step with the trend toward finer finishes and close limits.

See the representative nearest you about sending us samples for grinding in order that you may see Blanchard finish and accuracy on your own work.

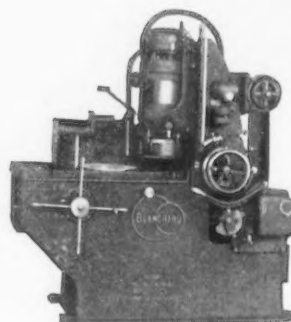
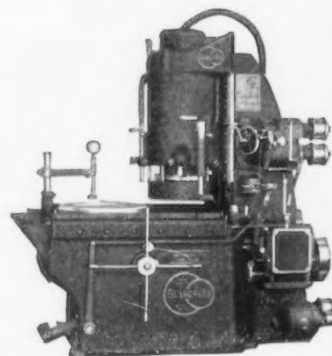
Henry Prentiss & Company, Inc.
New York, Boston, Buffalo, Hartford, Rochester and Syracuse

Motch & Merryweather Machinery Co.
Cleveland, Cincinnati, Detroit and Pittsburgh
Marshall & Huschart Machinery Co. . . *Chicago*
W. E. Shipley Machinery Co. . . . *Philadelphia*
Marshall & Huschart Machinery Co. of Indiana
Indianapolis

Elliott & Stephens Machinery Co. . . . *St. Louis*
Kemp Machinery Co. *Baltimore*
Robinson, Cary & Sands Co. *St. Paul and Duluth*
Hendrie & Bolthoff Manufacturing & Supply Co.
Denver

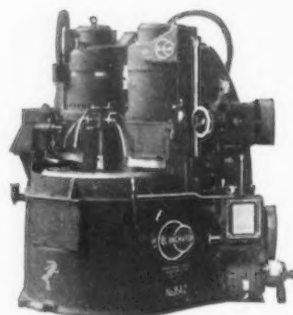
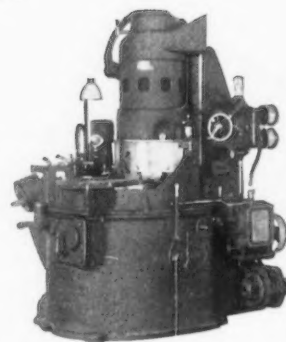
Harron, Rickard & McCone Co.
San Francisco and Los Angeles
Woodward Wight & Co., Ltd. . . . *New Orleans*
Sam H. Penny *Houston, Texas*
Tidewater Supply Co. *Norfolk, Va.*
Star Machinery Co. *Seattle*

No. 16
Applicable to a wide range of production work and also to die and tool work.



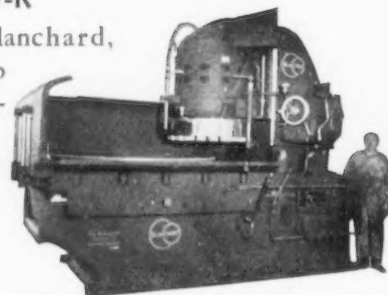
No. 10
Especially suited to tool rooms and where production does not warrant a larger machine.

No. 16-A
Automatic Sizing; operator only loads work; for high production and uniform accuracy on small parts.



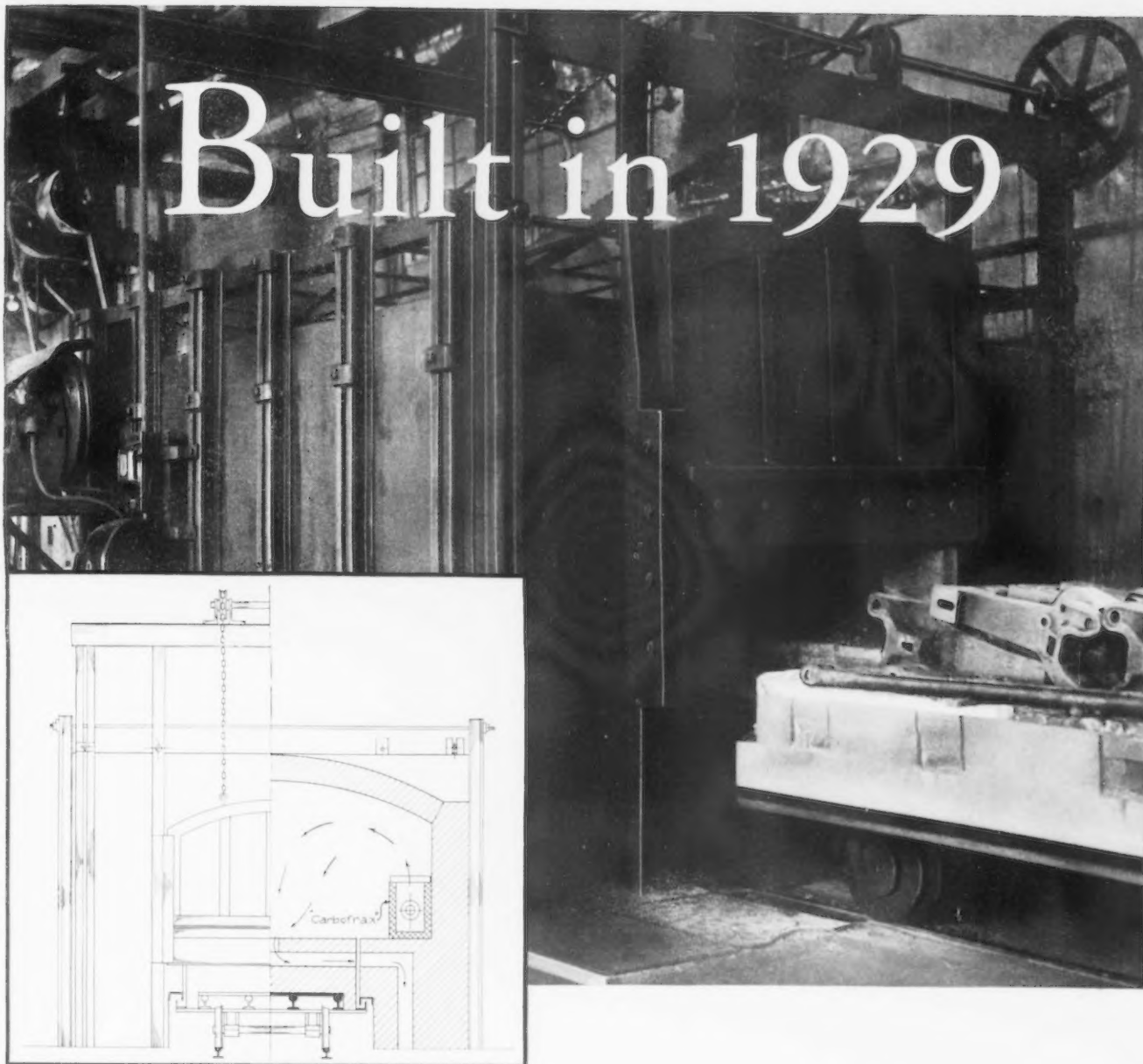
No. 16-A2
Two Spindles, one roughing and one finishing, each with Automatic Sizing.

No. 27-R
The largest Blanchard, capacity up to 96 in. diameter.



THE BLANCHARD MACHINE COMPANY
64 STATE STREET **CAMBRIDGE, MASS.**

Built in 1929



STILL OPERATING PERFECTLY WITH NO REPAIRS

FIVE years ago, a well known railroad designed and built this car type furnace for annealing and carburizing. The oil fuel is fired into two "Carboradiant" combustion chambers built of "Carbofrax" brick and tile—the Carborundum Brand Silicon Carbide Refractory. The combustion gases then pass to the charge through properly spaced openings in the chamber tops.

The result of using the "Carboradiant" method of firing has been five years of proper heat delivery to the work, uniform temperature distribution throughout

the furnace, extremely low fuel consumption, and simplified control since only two burners are required.

Add to these advantages economy of upkeep. There have been no repairs to chambers or furnace. These results are due to the high heat conductivity, the strength and durability of "Carbofrax," plus the effectiveness of "Carboradiant" combustion chamber firing.

Adaptable to other types of furnaces with similar advantages. Engineering data on request.

"CARBOFRAX"

REG. U. S. PAT. OFF.

The Carborundum Brand Silicon Carbide Refractory

BRICK - TILE - MUFFLES - HEARTHS - CEMENTS

THE CARBORUNDUM COMPANY

(Refractory Division) Perth Amboy, N. J. District Sales Branches: Chicago, Cleveland, Detroit, Philadelphia, Pittsburgh. Agents: L. F. McConnell, Birmingham, Ala.; Christy Firebrick Company, St. Louis; Harrison & Company, Salt Lake City, Utah; Pacific Abrasive Supply Co., Los Angeles, San Francisco, Seattle; Denver Fireclay Co., El Paso, Texas; Williams and Wilson, Ltd., Montreal-Toronto, Canada. (Carborundum and Carbofrax are registered trade-marks of The Carborundum Company.)

THESE DISC-WHEELS SURFACE GRINDING

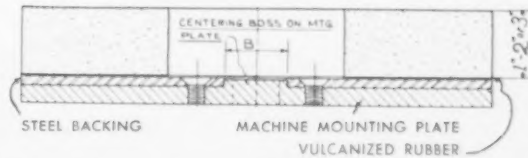


SHOW REAL SAVINGS ON JOBS...

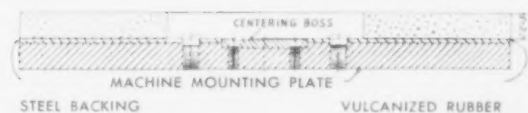
DISC-WHEELS offer many decided advantages over the ordinary abrasive cloth discs for surface grinding. Disc-Wheels are built like grinding wheels—really a mounted wheel used as a disc. In the Disc-Wheels you get a wide range of gradings—more accurately controlled gradings and grits definitely suited to the job. They cut like grinding wheels—give a more uniform finish—cut fast and clean and because of their thickness they wear longer without change.

The Carborundum Company's Disc-Wheels are made in Carborundum Brand Silicon Carbide or Aloxite Brand Aluminum Oxide—bonded with Redmanol, a synthetic resin product of Bakelite Corporation. Made in three types. Notice also the safety features of these Disc-Wheels, all steel plate backings are $\frac{1}{8}$ inch or more in thickness—a rigid, sturdy backing.

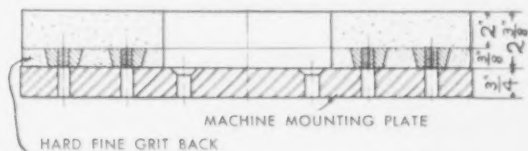
A layer of vulcanized rubber is inserted between the steel back and the abrasive. This acts as a cushion giving improved grinding action—permits expansion and contraction of steel plate, eliminating warpage. It provides a safe, secure mounting that permits operation at high speeds with safety. Write us for further data.



THE "D" Type Disc-Wheel for smaller, lighter work. The steel back is provided with countersunk holes for flat head screw mounting on machine plate. Sizes up to and including 20 inches in diameter.



The "G" Type Disc-Wheel for general work or larger, heavier work. Dowel pin type drive provided by special oval screws for mounting—a mechanically correct setting. Made in sizes up to and including 42 inches, also in 53-inch diameters made in segments. The "G" type is particularly recommended as best suited for all classes of work.



The "F" Type Disc-Wheel—known as Inserted Nut Type—nuts properly spaced and moulded into the abrasive. Disc-Wheel takes the bolts from machine head. Made in all standard sizes up to 30 inches in diameter.

THE CARBORUNDUM COMPANY

REG. U. S. PAT. OFF.
NIAGARA FALLS, N. Y.

Canadian Carborundum Co., Ltd., Niagara Falls, Ont. Sales Offices and Warehouses in New York, Chicago, Boston, Philadelphia, Cleveland, Detroit, Cincinnati, Pittsburgh, Milwaukee, Grand Rapids; Toronto, Ont. (Carborundum and Aloxite are registered trade-marks of The Carborundum Company.)

ASK "BAIRD" ABOUT IT

Automatic, High Production Machinery to produce metal

BUCKLES	HOOKS AND EYES	PIN TICKETS
BAILS	FASTENERS	SLIDES
BUSHINGS	HAIRPINS	SPRINGS
BUTTONS	HINGES	THUMB TACKS
CHAIN	HOOKS	HANDLES
CLIPS	LOOPS	CLASPS
COTTER PINS	PAPER CLIPS	WIRE PARTS
CORSET STEELS	PINS	RIBBON METAL PARTS

and machines to turn and drill forgings or castings

MACHINES LIKE

AUTOMATIC LATHES OR CHUCKING MACHINES.

Horizontal and Vertical, 6 spindle and 8 Spindle, for chucked work and for centered work.

AUTOMATIC GRINDERS.

Multiple spindle—automatic chucks—
Automatic dressing and adjusting of wheels.

WIRE FORMING MACHINES. Many sizes.

RIBBON METAL FORMING MACHINES. Different kind.

SPRING MAKING MACHINES. Several types.

AUTOMATIC PRESSES. Single and double action. Tandem and Transfer Presses.

TUMBLING BARRELS. Tilting and horizontal for smoothing, japanning etc.

HEATED DRYING BARRELS. Adds lustre as well as dries.

BALL BURNISHING BARRELS. Burnishes thousands of metal pieces at one time with glass hard steel balls.

THE BAIRD MACHINE COMPANY

BRIDGEPORT, CONN., U. S. A.

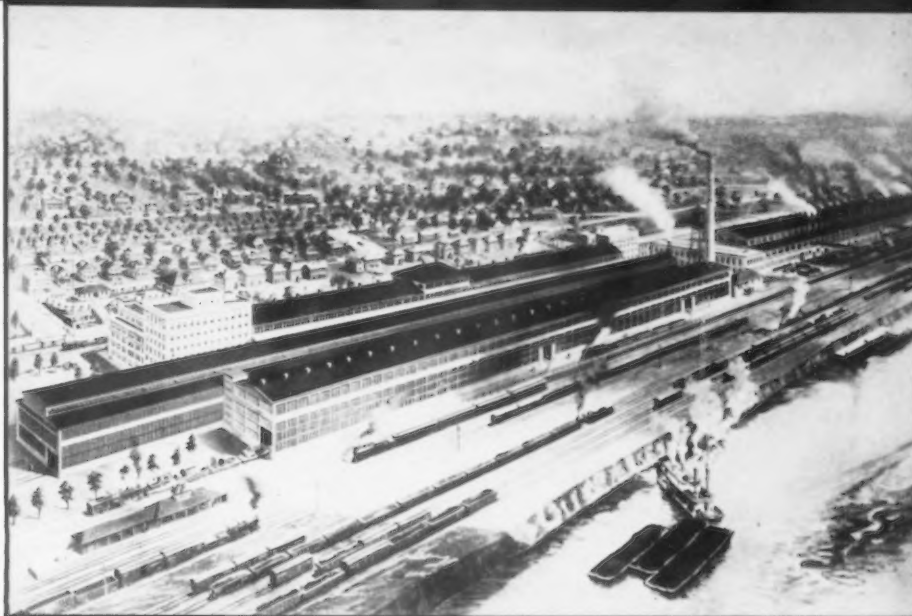


*Since 1849 Specialists in High Grade Automatic Machinery to
Produce the Common Metal Articles in Use by High Production*



ROLLS AND STEEL MILL EQUIPMENT

The largest unit plant in the world devoted to the production of ROLLS and STEEL MILL EQUIPMENT.



Plant and General Offices—Mesta Machine Company—West Homestead, Pa., Pittsburgh District

MESTA PRODUCTS

ROLLING MILL MACHINERY

MILLS—Bar, Blooming, Continuous, Merchant, Piercing, Plate, Rail, Sheet, Slabbing, Strip, Structural, Tin Plate, Tire, Tube, Universal, Wheel. Four High (Hot and Cold) MILLS.

SHEARS—Rotary Flying, Bar, Bloom, Doubling, Lever, Plate, Squaring, Hydraulic and Steam Hydraulic.

Gear Drives, Mill Tables, Manipulators, Saws, Transfers, Trimmers, Slitters, Levellers, Coilers.

ROLLS and MILL PINIONS

ROLLS—Steel and Alloy Steel, Chilled and Sand Iron, Alloy Iron, "Mesta Special" Alloy Steel, Mesta Hardened and Mesta Hardened Chilled.

PINIONS—Iron, Steel, Alloy Steel, Cut Tooth and Machine Molded.

ROLL LATHES—ROLL GRINDERS

MESTA Continuous Pickling Trains

MESTA Patented Pickling Machines

MESTA Electrolytic Cleaning Equipment

MISCELLANEOUS MACHINERY

Cut and Machine Molded Iron and Steel Gears, Flexible Couplings, Hydraulic and Steam Hydraulic Forging, Bending and Forming Presses, Accumulators, Planers, Draw Cut Shapers, Air Compressors, Rope Drives, Large Power Presses, Barometric Condensers, Vacuum Pumps.

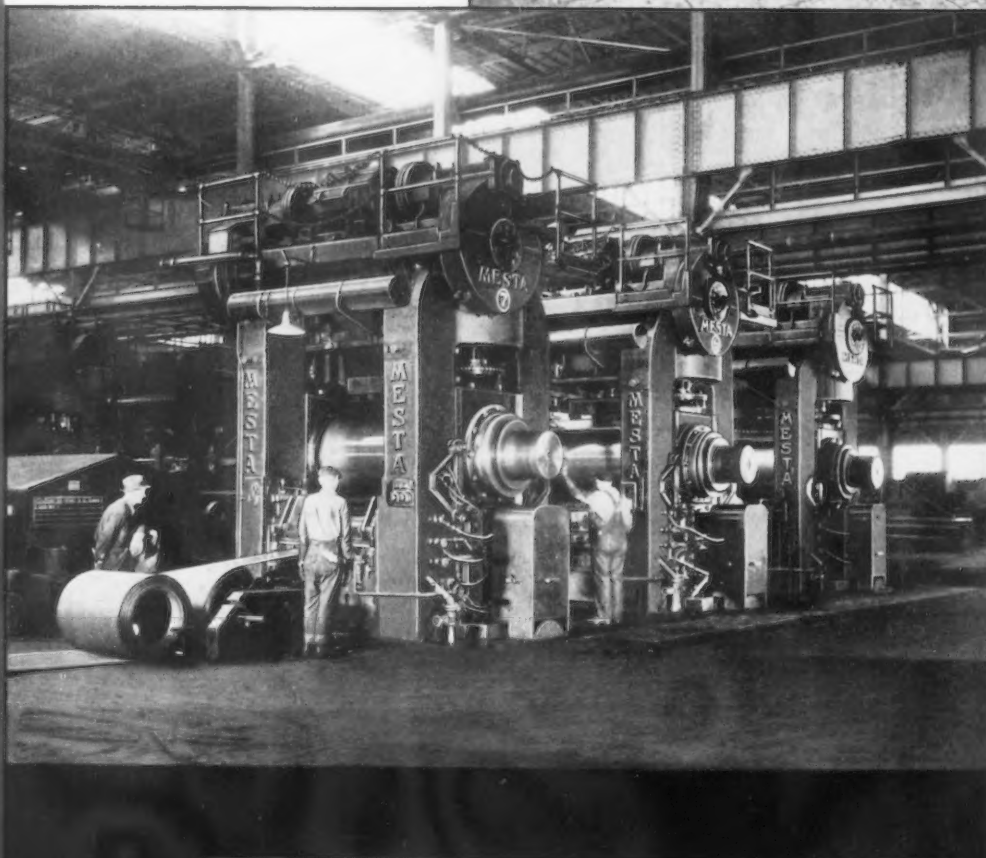
GAS and STEAM ENGINES, including Una-Flow Type. Mesta Automatic Plate Valves (Iversen Patents)

FORGINGS—CASTINGS.

Mesta

MESTA FOUR HIGH CONTINUOUS HOT MILLS

Designed and built by Mesta to operate with efficiency at minimum maintenance—to meet maximum production schedules—to produce continuously plate and strip of the highest quality.



Accurate control of these mills produces uniform gauge and finest quality at high speeds. High tonnage with exceedingly low maintenance costs.

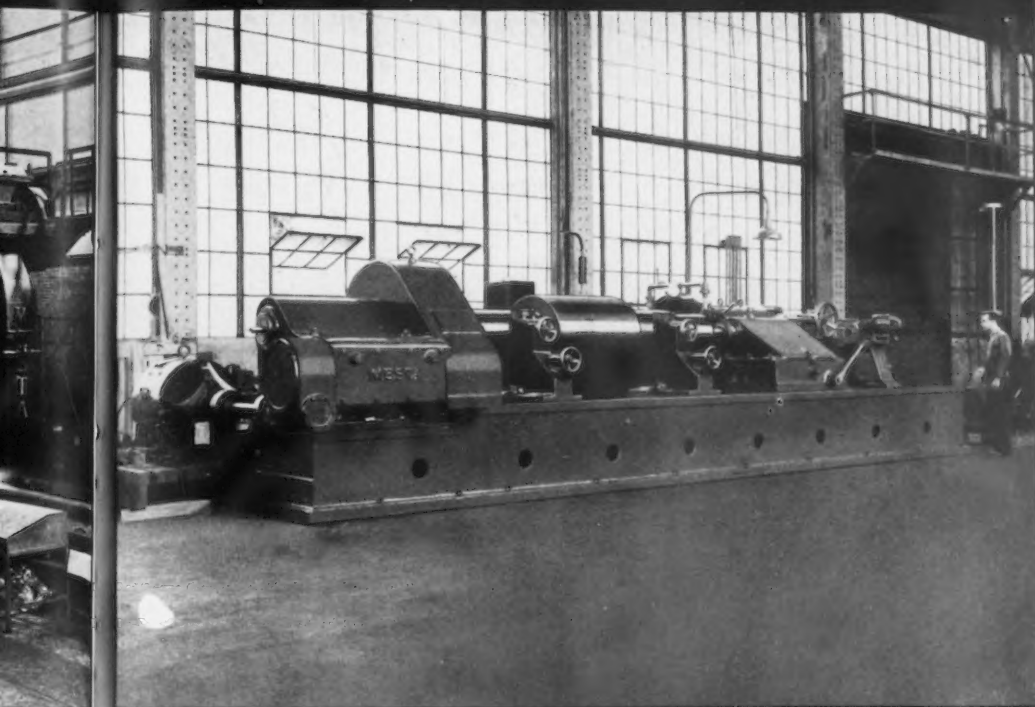
MESTA FOUR HIGH CONTINUOUS COLD MILLS

MESTA ROLL GRINDERS

A machine of precision for the finest finishing—but rugged enough to do the heaviest kind of roughing.

Crowning and concaving attachment an integral part of machine and guaranteed to produce any desired amount of crowning or concaving absolutely uniform and accurate.

Anti-friction bearings throughout.



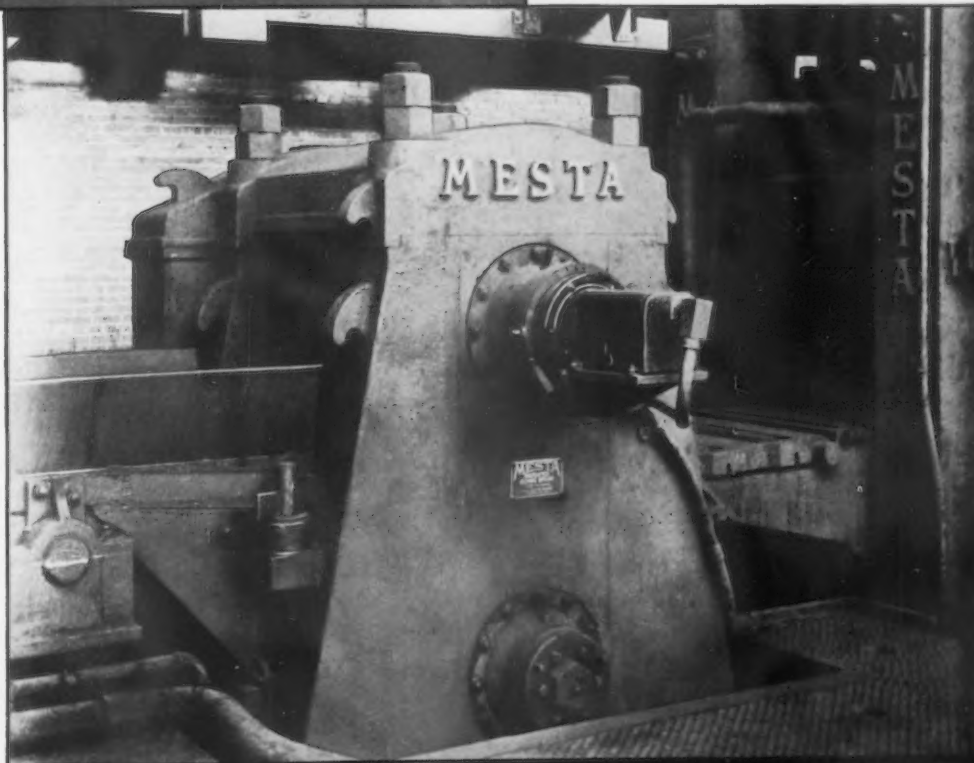
of these
uniform
quality
gh ton-
ngly low
s.

Simple, rugged design.

Many units in successful operation, cutting a variety of products.

Will cut hot material at mill speeds.

Cold shears designed for precision cutting to length.



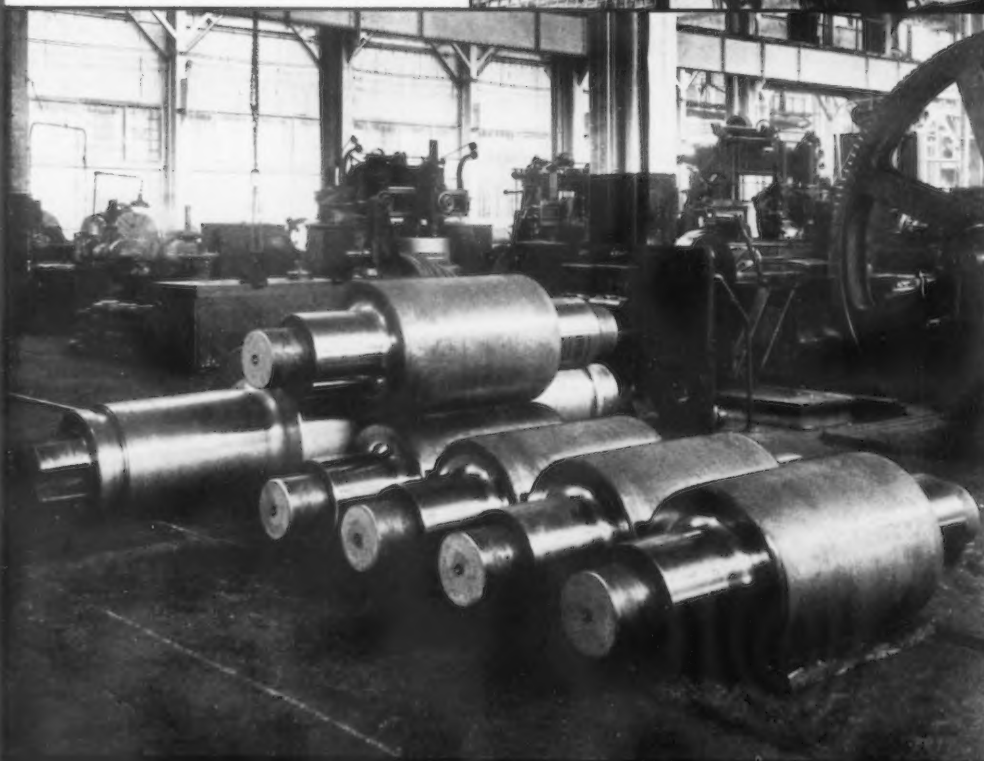
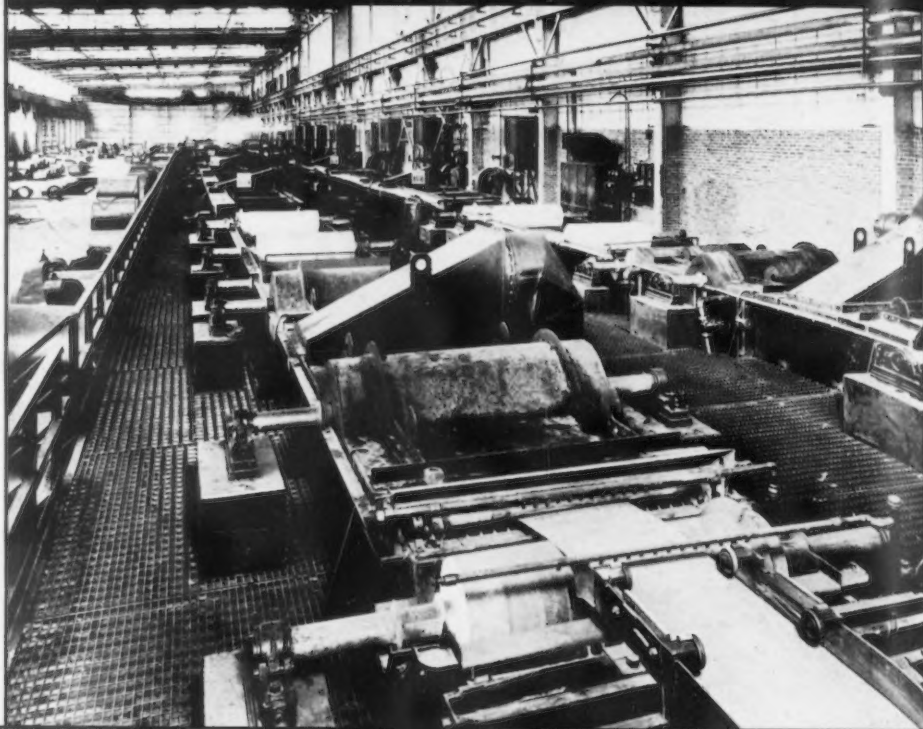
LLS

MESTA ROTARY FLYING SHEARS

MESTA CONTINUOUS PICKLING EQUIPMENT

Operates with continuity and speed providing unfailing service to subsequent operations in the modern strip mill.

Ruggedly built to insure dependability and eliminate chance of breakdown.



The UNIFORMITY of Mesta Rolls year after year is largely responsible for their wide acceptance in the steel industry.

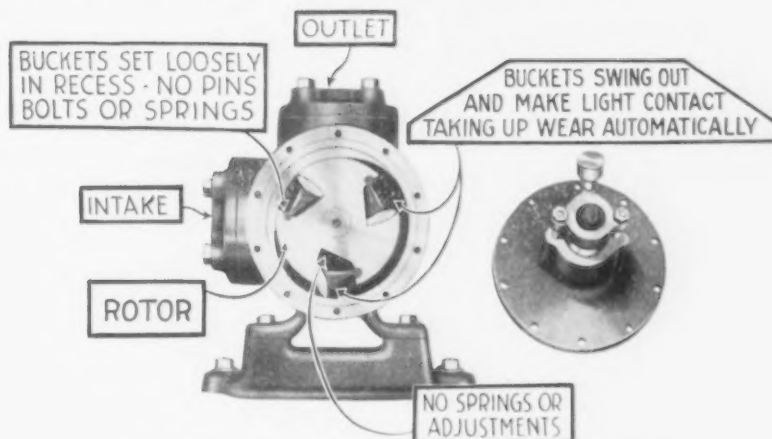
GROUP OF MESTA ROLLS

CONSIDER ROTARY PUMPS FOR YOUR PUMPING PROBLEMS

WE ARE NOW HANDLING:

Acids	Molasses
Asphalt	Printing Ink
Drugs	Silicate of Soda
Paints	Soaps
Varnish	Water
Petroleum Products	Fuel Oil
Vegetable Oils	Cutting Oils
Glucose	

and many other liquids



END VIEW OF A BLACKMER ROTARY PUMP

A ROTARY PUMP is outstandingly the best solution for many jobs and in some cases the only practical solution. Many plant executives fail to consider a rotary pump as a distinct type of pump having certain advantages not possessed by either centrifugal or reciprocating types of pumps. There is a distinct difference not only in theory and design, but also in practical performance.

Rotary pumps, like reciprocating pumps, are positive in displacement. A good rotary pump has a *positive suction lift*—no priming is necessary—high suction lifts are practical. This positive displacement means *constant capacity regardless of variations in discharge head*.

Rotary pumps are *general purpose pumps*. Changes in pressure requirements or material handled do not ordinarily require any change in a rotary pump.

The actual operating efficiencies of good rotary pumps properly specified and properly installed are comparable with the peak efficiencies of any other type of pump. There is no necessity of

matching each pump to its installation to secure peak efficiencies when you specify rotary pumps. Rotary pumps, like centrifugals, are compact—their rotary motion eliminates cumbersome crankshafts and drive rods—saves floor space.

Rotary pumps are simple and trouble-free—with few working parts.

Rotary pumps compare favorably in cost for service rendered with any other type of pump.

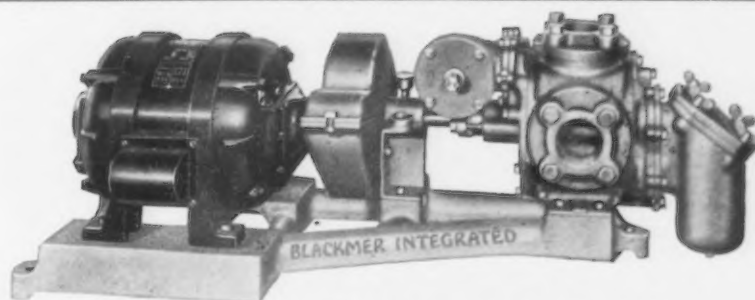
BLACKMER ROTARY PUMPS are leaders of their field. They have been *handling MORE GALLONS PER DOLLAR* in hundreds of industries for more than twenty-five years. BLACKMER'S exclusive principle of automatic-take-up-for-wear in the BLACKMER BUCKET DESIGN has made this possible. The buckets take the wear. The inexpensiveness of the buckets and ease with which they can be replaced result in low maintenance cost.

Write for our new bulletin DB-300 describing the principal items in our line. Give us the details of your pumping problems and our engineers will be glad to make recommendations.

BLACKMER PUMP CO.

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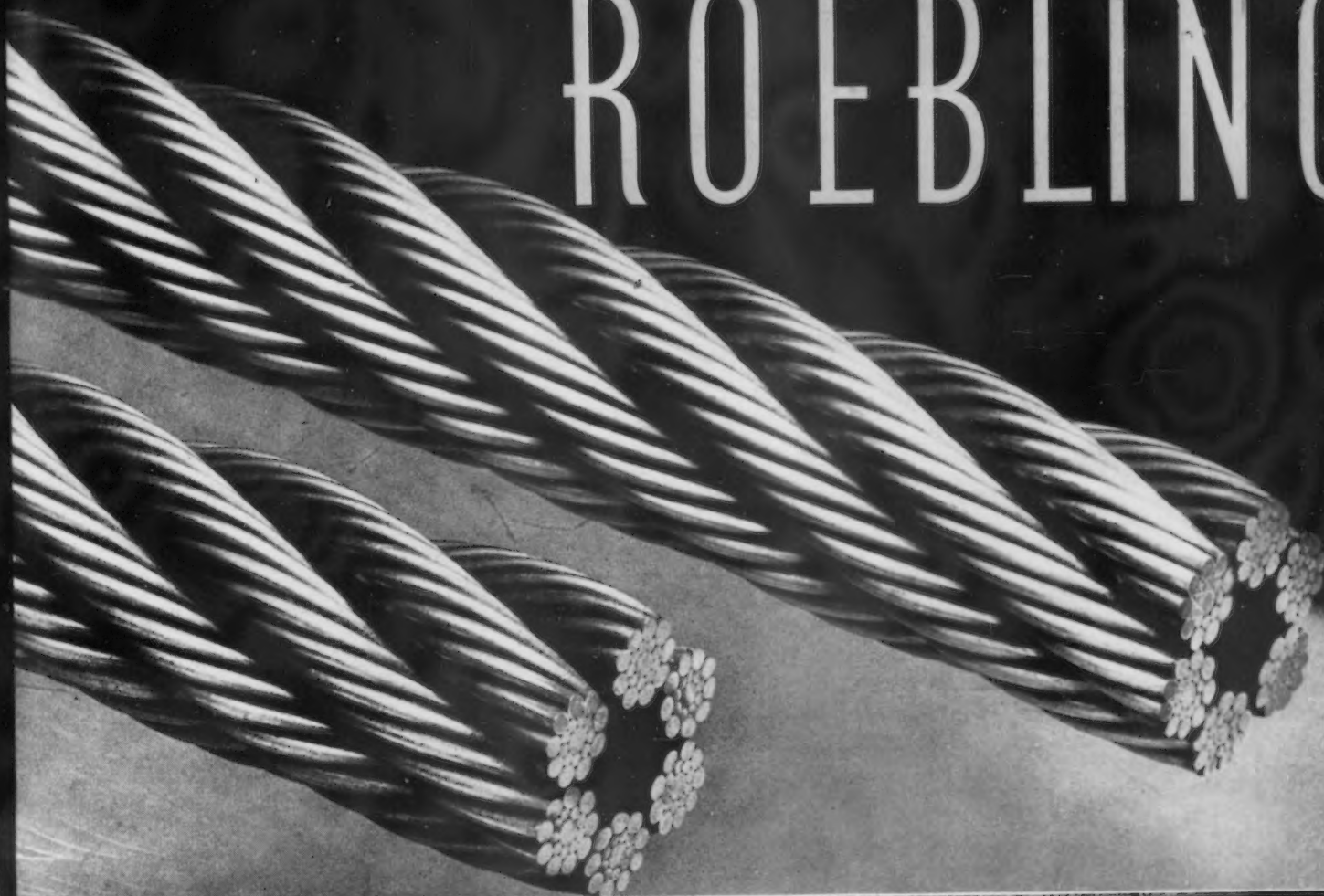


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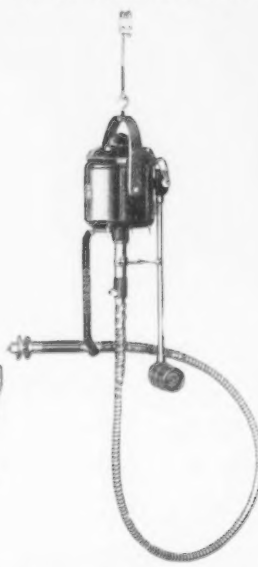
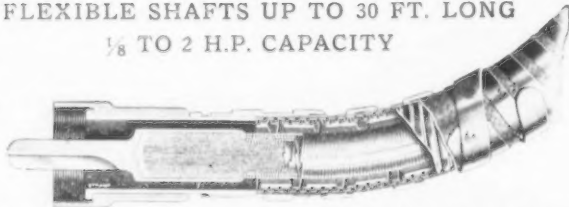
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"Cleveland" Distributors everywhere are ready to serve you

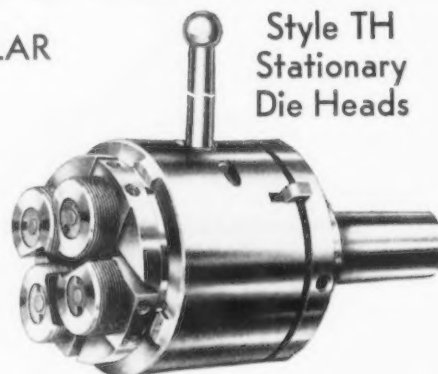
GEOMETRIC TOOLS DO THE WORK

PRODUCTION

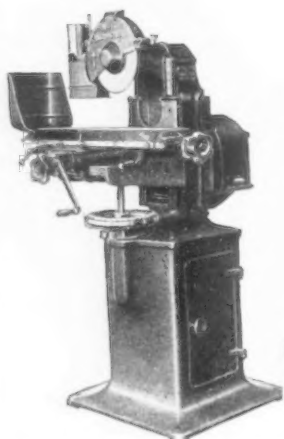


Style TR
Rotary Die Heads

TANGENT OR CIRCULAR
CHASERS

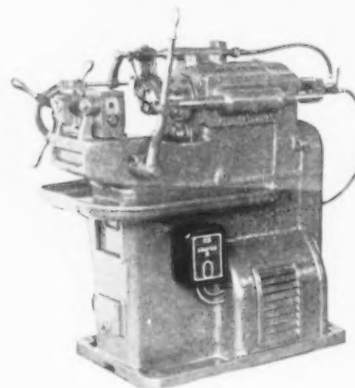


Style TH
Stationary
Die Heads



Chaser
Grinders

The tools shown on these two pages are only some of the more popular types built by Geometric. Many other types are carried in stock to say nothing of a large number of special tools built on receipt of order.



Threading
Machines

Specializing in thread cutting tools since 1895, The Geometric Tool Company not only is a pioneer in the industry but in addition builds the most complete range of types and styles of Self-Opening Die Heads and Collapsing Taps.

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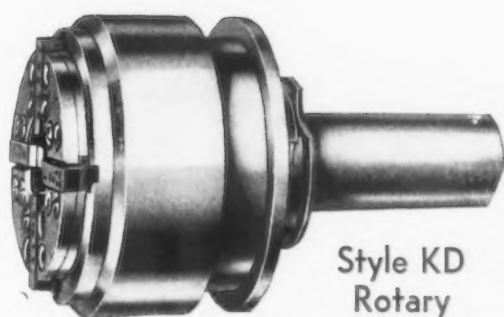
Whatever type your machine and whatever your choice of chasers, you can go to Geometric with the assurance of getting what you want—and getting it from a concern which has devoted a lifetime of experience to the one field of production threading.



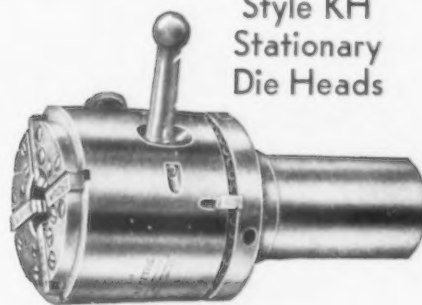
The Geometric Tool C

A TYPE FOR EVERY NEED

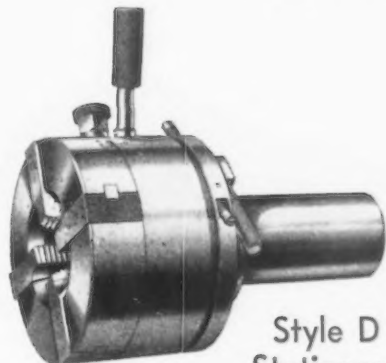
THREADING



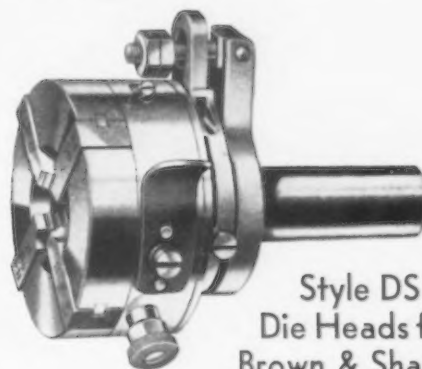
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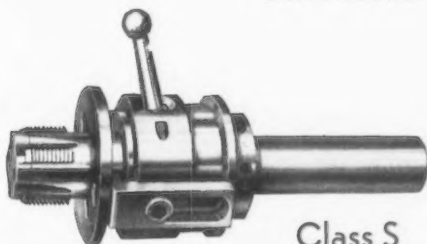
Style KH
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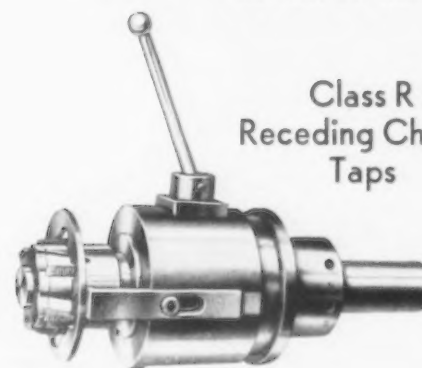
Style D
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Die Heads



Style DS
Die Heads for
Brown & Sharps



Class S
Collapsing Taps



Class R
Receding Chaser
Taps



Class SJ Solid Adjustable Taps

ol Co., New Haven, Conn.



1882

1935

THE CURTIS & CURTIS COMPANY

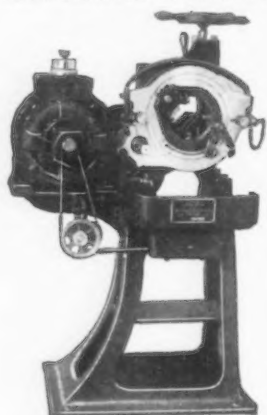
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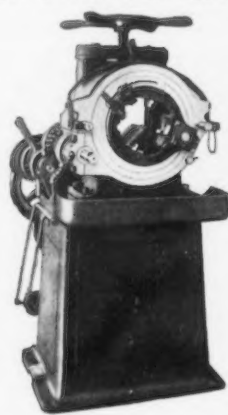
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DIRECT-CONNECTED ELECTRIC



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DIE HEAD

with
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Chasers

SLASHES THREADING COSTS



H&G

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Write us for literature and details of savings made in other plants. We want you to know about its many advantages.

If your production is such that this head will pay for itself in a very short time we can arrange for a 30-day trial.

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Manufacturers of the WORLD FAMOUS H & G Self-Opening Die Heads

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And Its Products

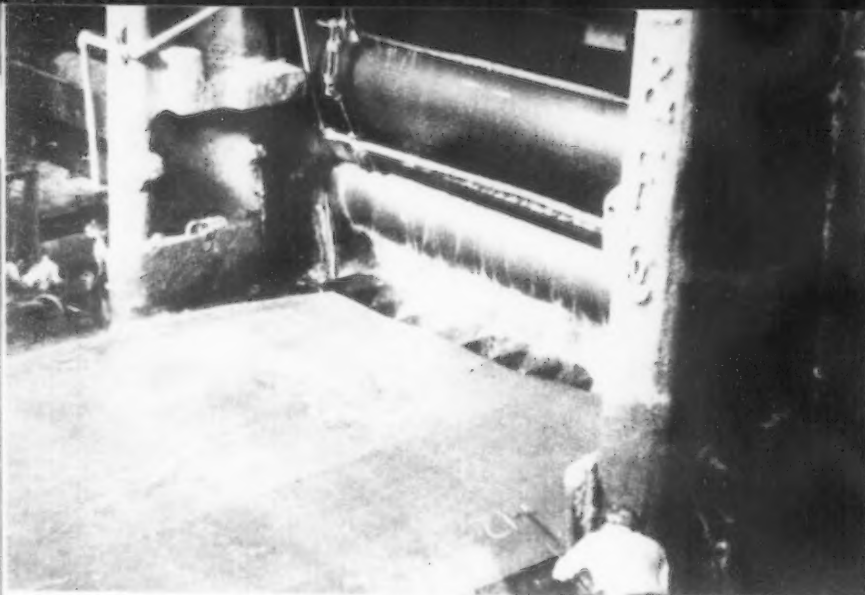
LUKENS STEEL COMPANY

FIRST TO ROLL BOILER PLATE IN AMERICA

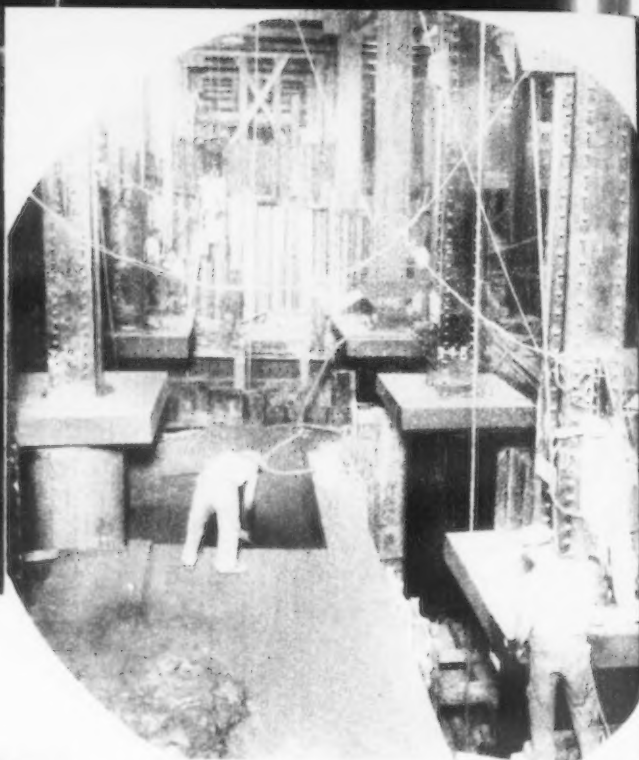
DIVISIONS

BY-PRODUCTS STEEL CORPORATION • LUKEWELD, INC.

CORTESVILLE, PENNSYLVANIA

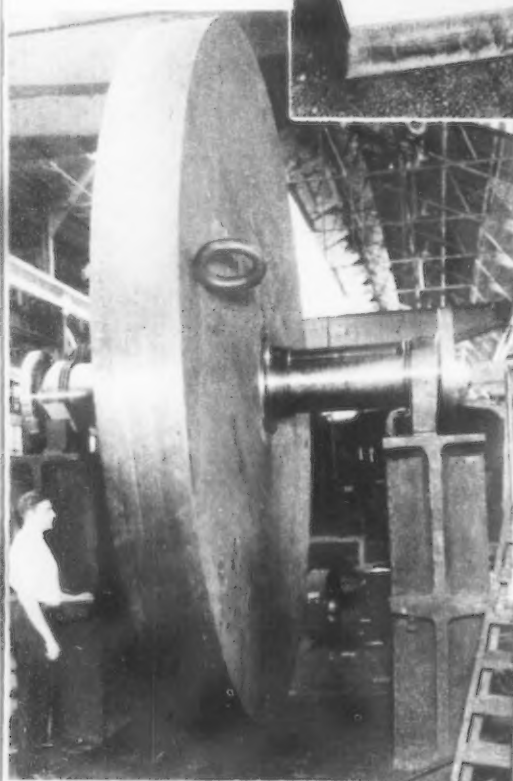


Above . . . Rolling a wide plate on the Lukens 206" mill, world's largest plate mill. It has rolled ingots weighing 90,000 lbs., and produced plates weighing 50,000 lbs. It can roll plates up to 25" in thickness, and up to 196" wide.

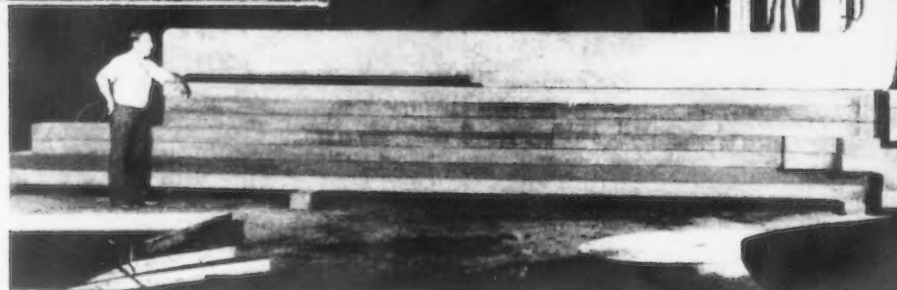


Above . . . Lukens Base Plates were used in construction of the Bank of Manhattan Building, New York. Base plates for buildings, bridges and machinery can be rolled by Lukens up to 25" thick, in weights up to 50,000 lbs.

Right . . . Side frame, one of four for a printing press manufacturer, flame-cut by Lukens from a 61 1/2" plate. Flame-cut steel plate makes a stronger, more rigid part, generally with less weight and with economy in cost.



Above . . . Flywheel for a motor generator set, fabricated from four circular plates rolled and flame-cut by Lukens, each plate being 4" thick, 190" in diameter, weighing over 17 tons. Lukens produces circular plates up to 196" in diameter.



Above . . . Flame-cut unit for blooming mill manipulators made by Lukens from steel plates 5 1/2" thick, and finished by United Engineering & Foundry Company, Pittsburgh, Pa., for a rolling mill at the Ford Motor Company, River Rouge Plant, Dearborn, Mich. The manipulators range in width from 51" to 54", and from 306" to 385" in length, and weigh approximately 10,000 lbs. each. Heavy units for machinery and equipment can often be produced more economically and speedily by flame-cutting from heavy plates.

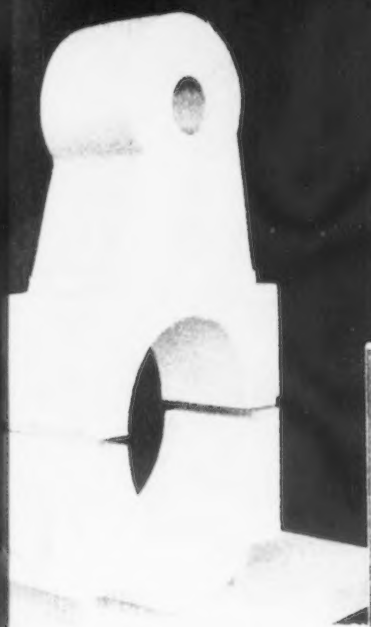
192.91' X 192.91' X 2.95"
WEIGHT 31480 LBS.
ROLLED BY LUKENS STEEL CO.
COATESVILLE, PA.
WORLD'S LARGEST PLATE MILL

Left . . . En route for fabrication of a large pressure vessel, this 31,480 lb. plate rolled by Lukens is nearly 3" thick, almost 193" square. It is typical of the wide and thick plates produced by Lukens for plate and structural fabricators and machinery and equipment builders.

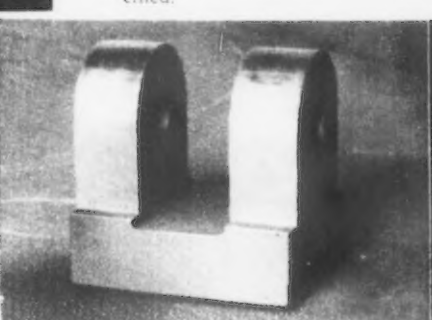
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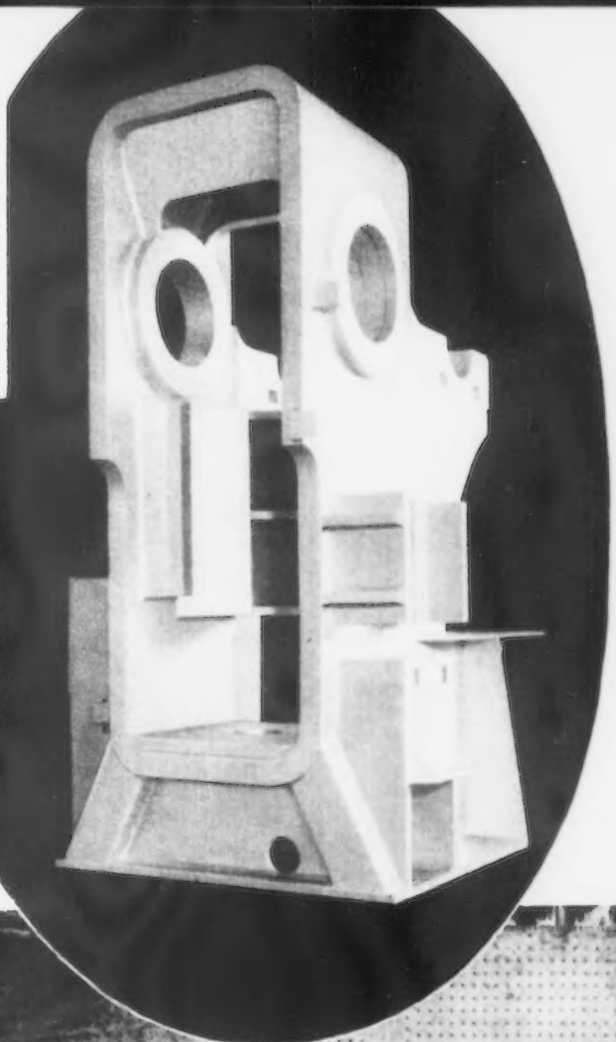


Above . . . Breakage of pitmans was minimized by an automatic forging machine manufacturer by the use of flame-cut steel plate. The picture shows one of the pitmans, flame-cut at Lukens from plate 7" thick.



Above . . . Difficult flame-cutting from a single piece of steel plate—no welding involved. Lukens can produce many intricate shapes by flame-cutting, usually with economy in first cost and betterment of the part. Send your prints to Lukens for quotation—possibly you may save and improve with flame-cut Lukens Plates.

Right . . . Welded by the Lukensweld division of Lukens, this frame for a 500-ton forging press typifies the modern method of building machinery and equipment. It is made entirely of special analysis heavy steel plates, 4½" thick in the main member, rolled by Lukens. The specification called for no more than .012" deflection between crankshaft and bed under 500-tons' load; actual deflection under the load was less than specified.

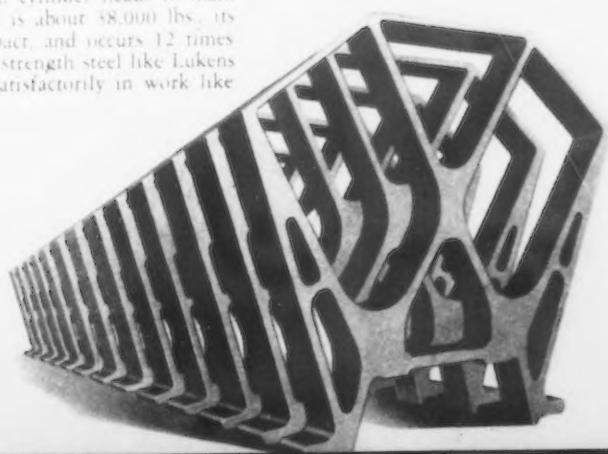


Above . . . Steam plate made from one Lukens plate, 445" long, 74½" wide, 3½" thick. An improved design of steam plate, developed by the Lukensweld division of Lukens, eliminates expensive drilling, gives more even steam distribution and removes the hazards of cold spots due to trapped water. If you are interested in steam plates, ask for complete data.

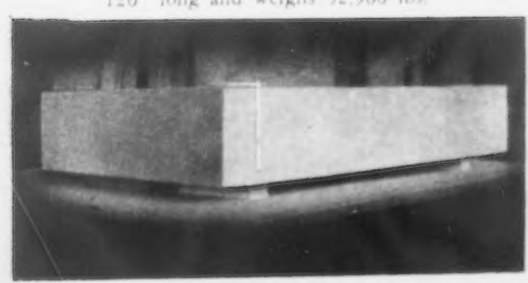


Above . . . Locomotive firebox and combustion chamber sheet made from one piece of Lukens locomotive firebox plate 250" long, 195½" wide, 3g" thick. Locomotive boiler and firebox plates, in carbon, Nickel steel and other special analyses, are Lukens specialties.

Below . . . Main members for Winton V-type Diesel engine frames produced at Lukens by flame-cutting from Lukens Cromansil steel plates, 3" thick. These members transmit gas loads from cylinder heads to main bearings. Gas load is about 58,000 lbs., its nature is pure impact, and occurs 12 times each second. High strength steel like Lukens Cromansil serves satisfactorily in work like this.

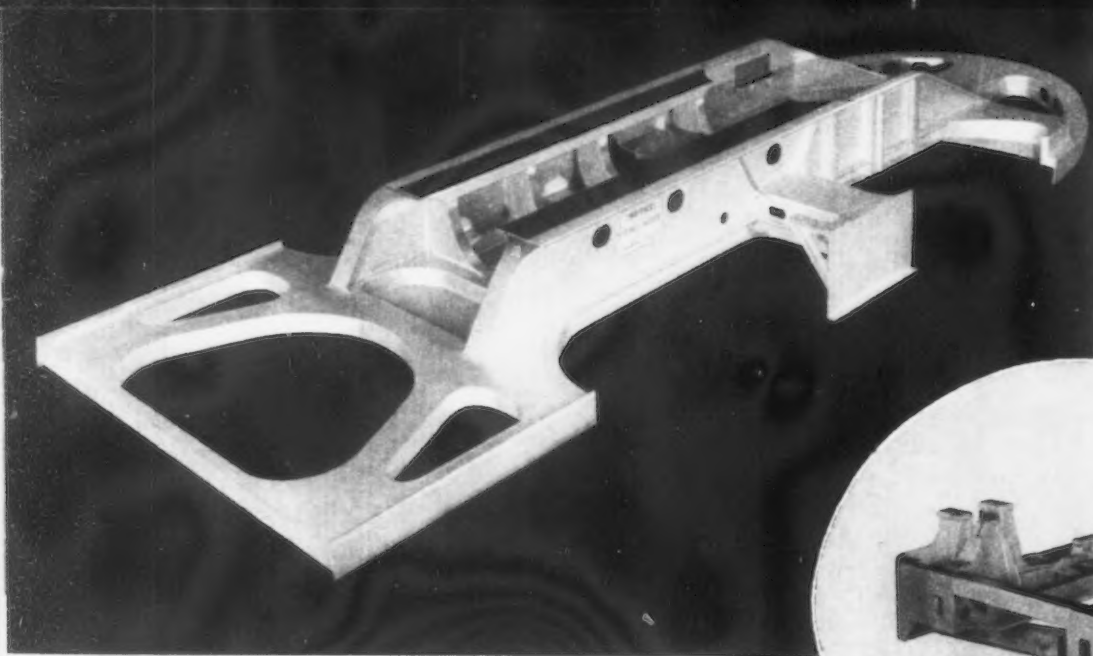


Below . . . Lukens Base Plate, flame-cut from one steel plate 21" thick. It is 72" wide, 120" long and weighs 52,900 lbs.

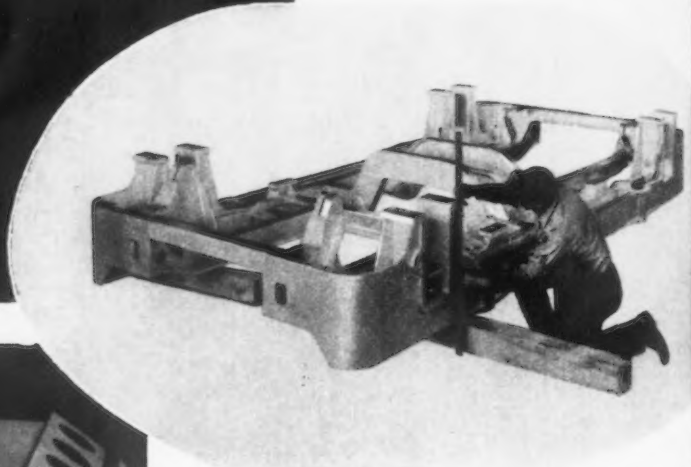


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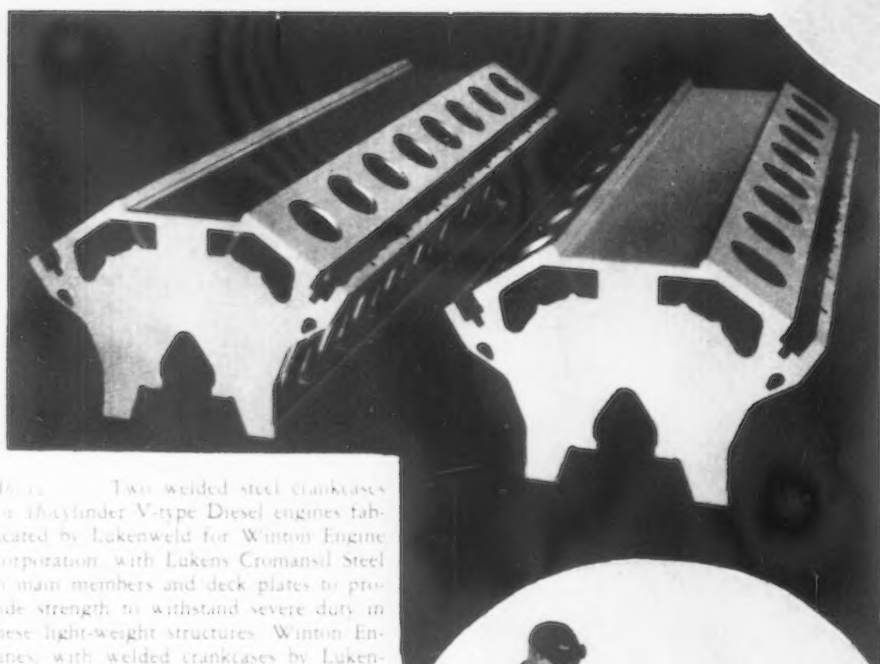
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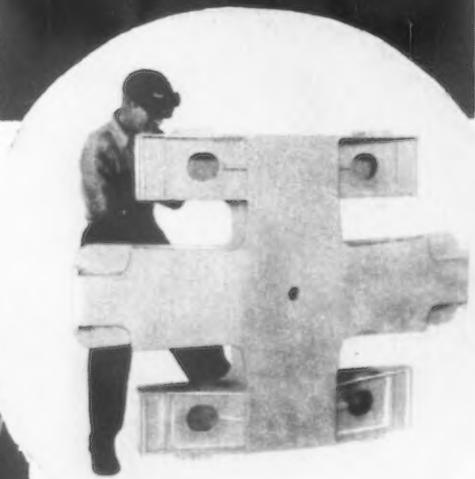
Left—Welded steel engine bed fabricated by Lukenweld entirely from Lukens Cromansil Steel, which forms the bed of the front half of the first car of the Burlington "Zephyr." It supports the engine, generator, compressor, batteries and controls—a load of about 60,000 lbs. on the welded engine bed which weighs only 6,000 lbs. Similar beds of Lukens Cromansil Steel have been made by Lukenweld for other high speed trains.



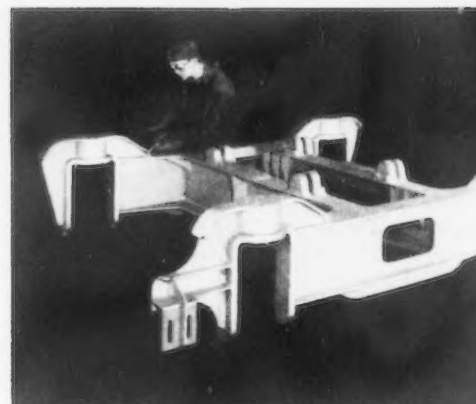
Above—Shop view of underside of welded steel truck frame used on Sperry Detector Car, fabricated by Lukenweld with Lukens Cromansil Steel in primary stress members to provide required strength. This frame weighed 3,970 lbs. before machining, contrasted with an estimated weight of 6,000 lbs. if produced by conventional methods. The weight-saving permitted use of a smaller size axle. Worthwhile weight reductions without sacrifice of strength are possible in properly designed, welded units of Lukens Cromansil Steel.



Above—Two welded steel crankcases for 14-cylinder V-type Diesel engines fabricated by Lukenweld for Winton Engine Corporation, with Lukens Cromansil Steel in main members and deck plates to provide strength to withstand severe duty in these light-weight structures. Winton Engines, with welded crankcases by Lukenweld, power the Union Pacific's high speed streamlined train and the Burlington "Zephyr."



Above—Welded steel bolster for rail way service, made by Lukenweld from Lukens Cromansil Steel, weighing 950 lbs. as shipped from the weldery.



Above—One of six welded steel trucks, fabricated by Lukenweld from Lukens Cromansil Steel, for multi-section stainless steel car built by The E. G. Budd Mfg. Co., for B. M. T. Lines, New York. This truck weighed 1,500 lbs. before machining.



Above—Completing the welding of a gear blank, 84" in diameter, in the Lukenweld shop. Thousands of gears made from welded blanks by Lukenweld are giving satisfactory service on a wide variety of machinery and equipment.

Right—Pinion stand of composite construction, using steel castings and steel plate, welded by Lukenweld from heavy plates rolled by Lukens, for United Engineering & Foundry Co., Pittsburgh, Pa. The two end bearing housings are cast steel; the side supports, bottom plate and connecting walls are steel plates. The cap is made from two heavy castings, one at each end, and a 1" plate used as a tie between the castings.



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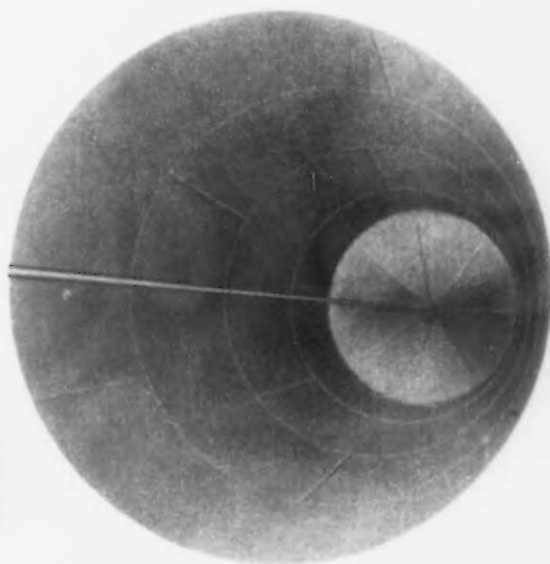
Below: Like previous America's Cup defenders, "Rainbow" sailed with Lukens Steel Plates. 40,000 lbs. of Lukens Cromansil Steel were used in sheer strake plates, deck stringer plates, gussets and brackets which hold the headstay sheaves and other hull rigging attachments subject to severe strain. The photograph was taken in the shipyard of Herreshoff Manufacturing Company, Bristol, R. I.



Above: Welded steel base for a large press under construction in the shop of Lukensweld, Inc. The four bearings are steel forgings welded in place.



Right: Interior of soap boiling kettle, 15' in diameter, 29' high, welded by a Pacific Coast fabricator entirely from Lukens Nickel-Clad Steel, for a manufacturer of fine soaps. Soap contacts only with pure Nickel surfaces and rust or contamination cannot occur. If you have a corrosion problem, why not find out how economically you can solve it with Lukens Nickel-Clad Steel?



Above: Checking dimensions on flame-cut end plates for use in welded steel crankcases for Diesel engines. Because of its experience in supplying flame-cut, beveled or formed pieces to its Lukensweld division for use in welded structures, Lukens is ideally equipped to furnish similar pieces to those producing their own welded structures. Ask how Lukens can serve you with shapes required in welding work.

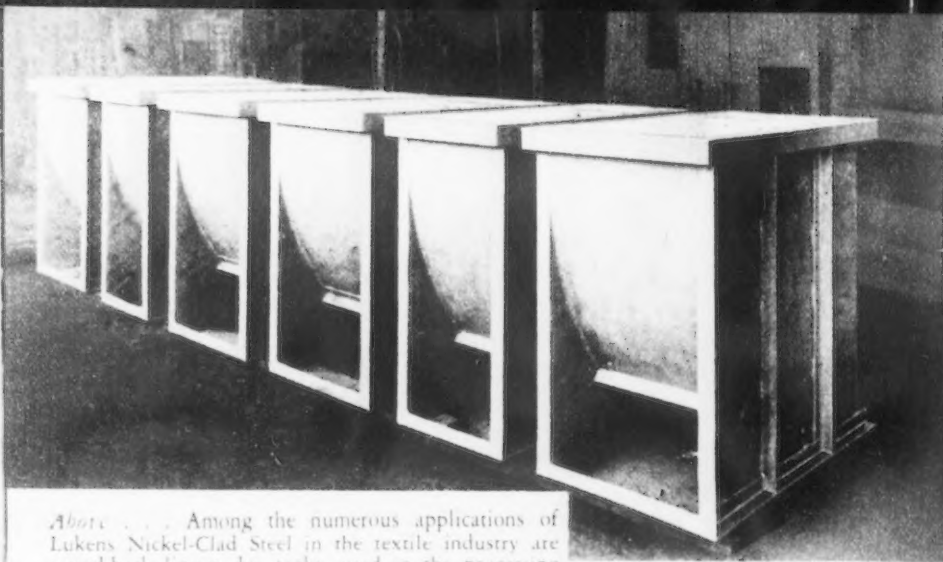
Below: Tank cars of Lukens Nickel-Clad Steel are employed in the transportation of phenol, caustic soda and other products. The Nickel-cladding prevents iron-contamination or other undesirable actions.

Above: A layer of pure, solid Nickel bonded to a steel base — Lukens Nickel-Clad Steel — gives all the corrosion-resistance of pure, solid Nickel construction, at economical cost in heavy equipment. Bulletins on request.



Right: Flame-cutting again proves a useful and economic tool in the production of these reentrant cut pieces. Dozens of other shapes are being flame-cut at a saving in cost along with improvement of the product. Send your blueprints to Lukens for quotation.





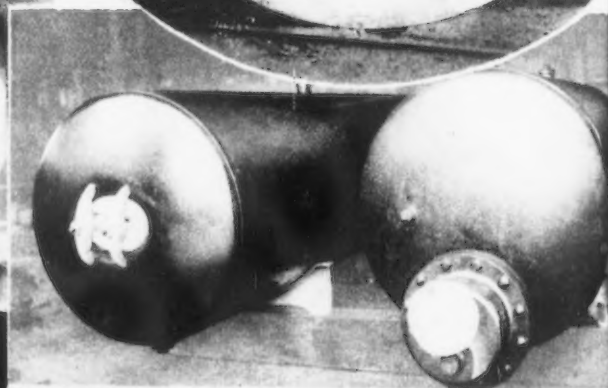
Above . . . Among the numerous applications of Lukens Nickel-Clad Steel in the textile industry are round-back liquor dye tanks, used in the processing of textiles. Each tank is 30" wide, 5' long and 5' deep.



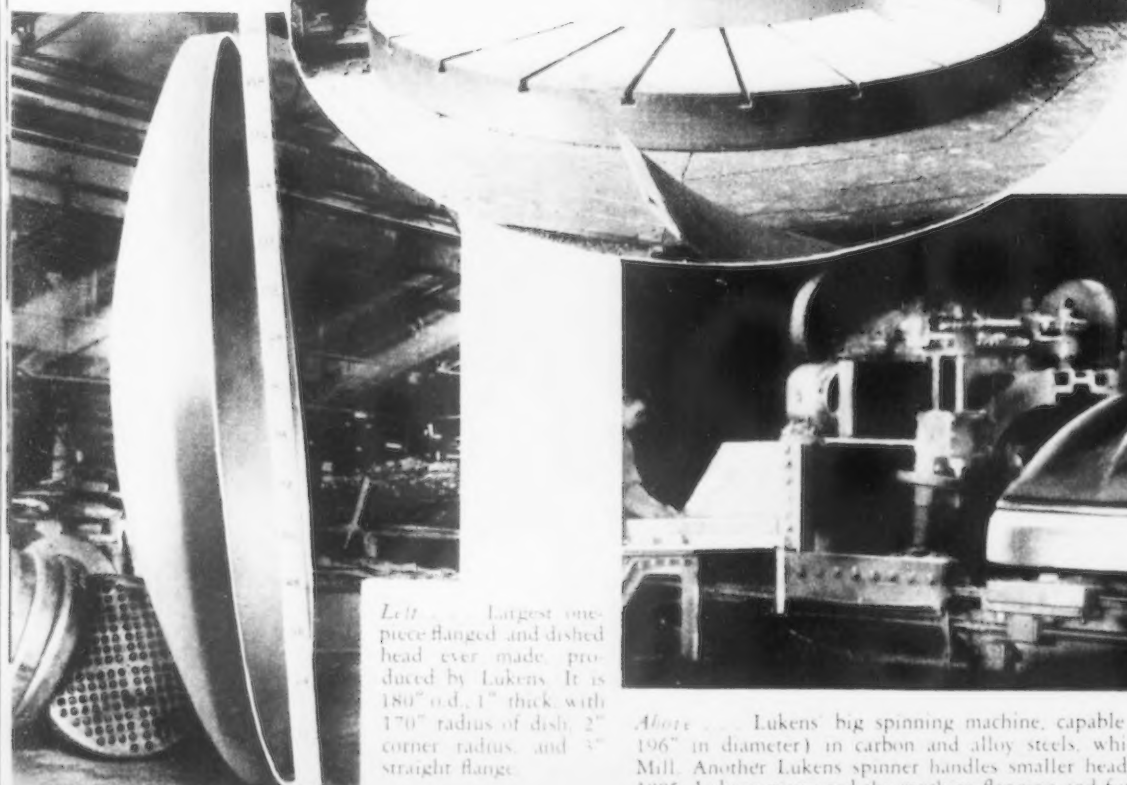
Above . . . Fusion-welded pressure vessels, 72" diameter, 23' long, made by a well-known fabricator from Lukens Nickel-Clad Steel. They were designed for a working pressure of 100 lbs. per sq. in. All welds were X-rayed and the entire construction is in accordance with the A. S. M. E. Code for Class 1 Welded Vessels.



Below . . . Suction head liner, flame-cut at Lukens for a dredge pump manufacturer. It is nearly 10' in diameter, and made from S.A.E. 3340 Nickel-Chromium steel plate, $\frac{3}{4}$ " thick.

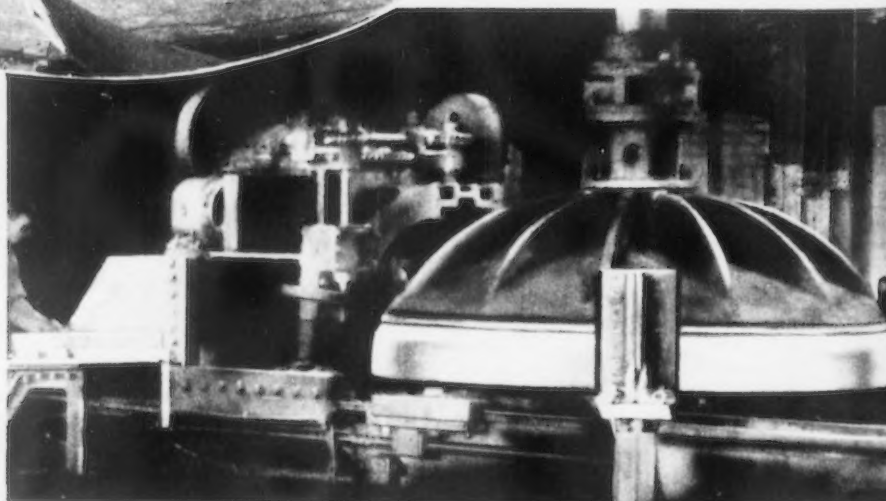


Above . . . No red or rusty water from these hot water heaters and storage tanks, made by a prominent fabricator from Lukens Nickel-Clad Steel. They are 168" in length, 48" in diameter. Water contacts only with the pure Nickel surface on the interior.

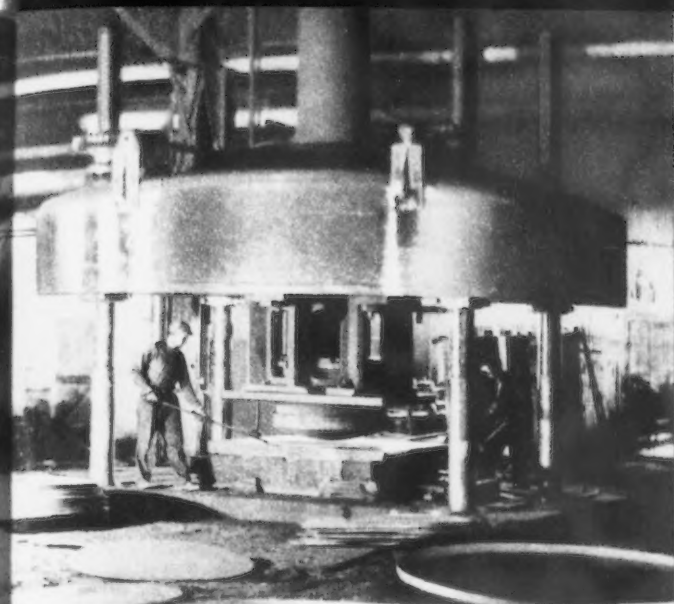


Left . . . Largest one-piece flanged and dished head ever made, produced by Lukens. It is 180" o.d., 1" thick, with 170" radius of dish, 2" corner radius, and 3" straight flange.

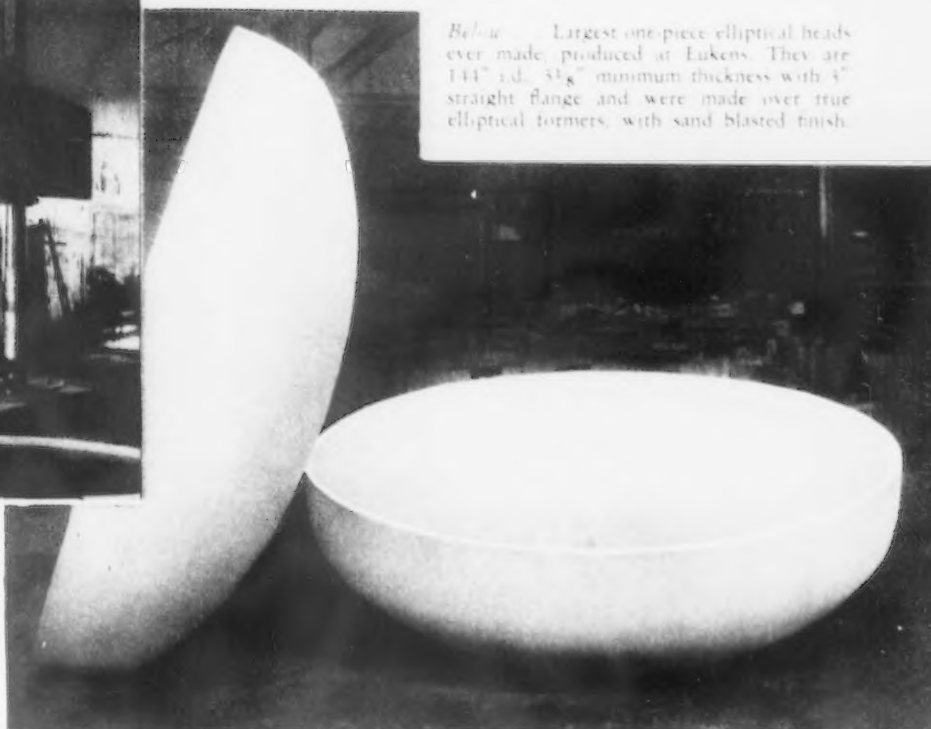
Left . . . A casing liner for dredge pump construction, made by Lukens from steel plate $\frac{3}{4}$ " thick and 26 $\frac{1}{4}$ " wide. In its circular form, it is almost 10' in diameter.



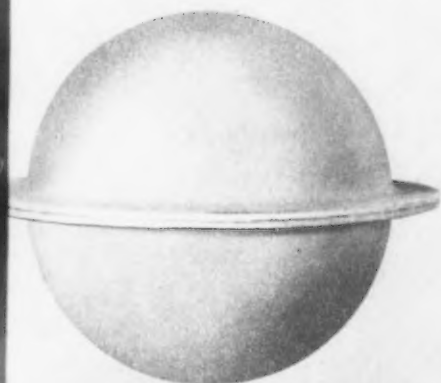
Above . . . Lukens' big spinning machine, capable of forming the largest circles (up to 196" in diameter) in carbon and alloy steels, which can be rolled on the Lukens 206" Mill. Another Lukens spinner handles smaller heads up to 48" outside diameter. Back in 1885, Lukens pioneered the machine-flanging and forming of boiler heads and other formed shapes required by fabricators.



Above . . . Lukens' 1,000-ton press, used in production of large pressed heads and other pressing work. The facilities of Lukens and its divisions also include twelve other presses of various capacities up to 1,500 tons.



Below . . . Largest one-piece elliptical heads ever made, produced at Lukens. They are 144" i.d., $3\frac{3}{8}$ " minimum thickness with 4" straight flange and were made over true elliptical formers, with sand blasted finish.



Left . . . Hemispherical pressed heads, made by Lukens. They are 48" inside diameter, $\frac{3}{4}$ " thick.



Left . . . Pressed steel evaporating pan, 48" i.d., $\frac{3}{8}$ " thick, with $26\frac{13}{64}$ " inside radius of dish and $16\frac{5}{8}$ " total overall depth, produced at Lukens. Pressed pans for this service must have very smooth inside surface for enameling.

Right . . . Pressed head for a concrete mixer, made by Lukens. It is $46\frac{7}{8}$ " i.d. and $\frac{3}{16}$ " thick. Note the cross-section. Other types of concrete mixer heads can be supplied to meet certain requirements.



Below . . . A view in the plant of the By-Products Steel Corporation division of Lukens, showing two of the many available machines. In the foreground are shown typical pressed heads produced by By-Products.



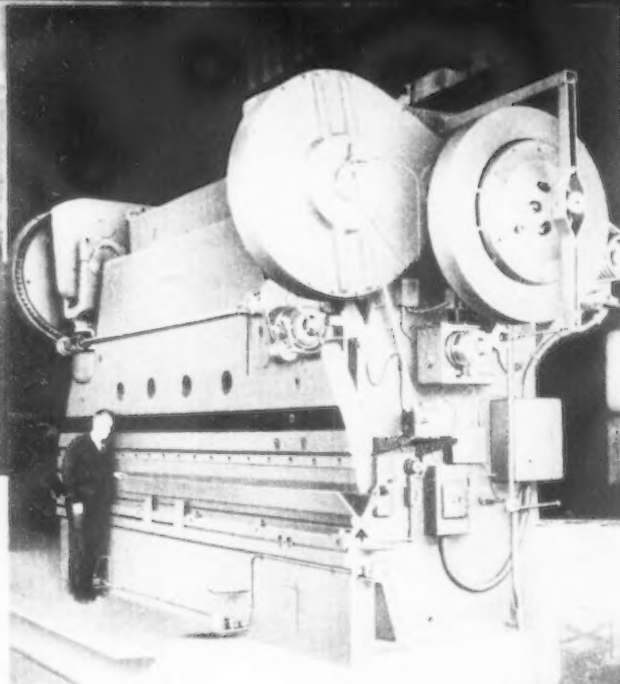
Above . . . Lukens has complete sand blasting facilities which are used when required by customers, in the production of heads or plates.



rusty water heaters and prominent Nickel-Clad length, 48" is only with the interior.

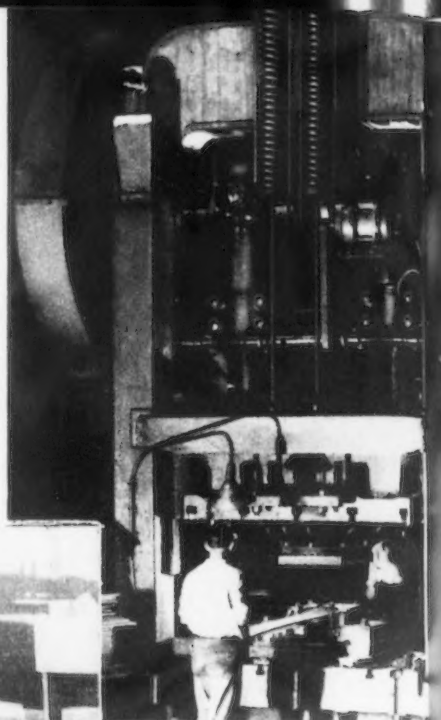
or dredge by Lukens and $26\frac{1}{4}$ " is almost

(up to 206" Back in formed

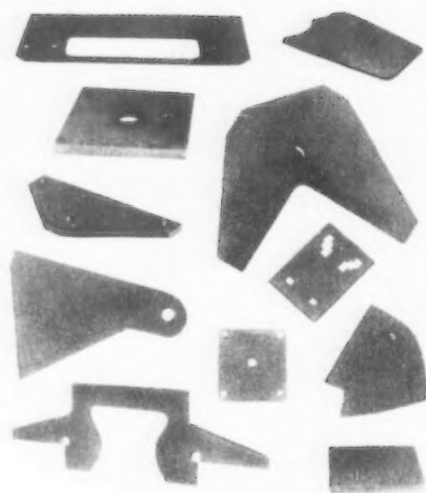


Left . . . The largest machine of its type ever built for the bending, flanging, forming and multiple punching of steel plate, recently installed in the By-Products division of Lukens. It can handle 1" thick plates up to 12' in width, and 3/4" thick plates up to 18' in width. Investigate the economies it makes possible in your designing and purchasing of formed parts and mechanical tubing. Send for the bulletin, "World's Largest Press Brake."

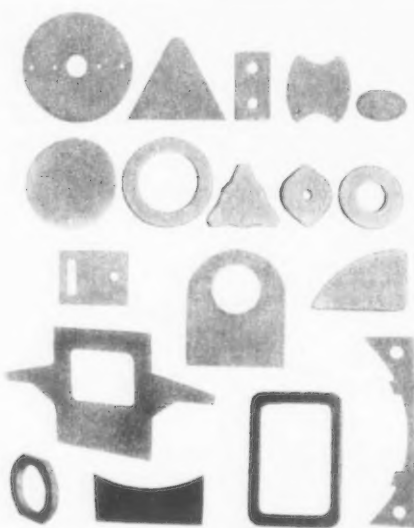
Right . . . One of a battery of large presses in the By-Products division, shown blanking circles for pressed heads. By-Products can press a wide variety of shapes, whether light or heavy, hot or cold, and usually with a saving to the buyer. It will pay you to investigate By-Products service.



Right . . . A view in the By-Products Steel Corporation plant at Coatesville, a division of Lukens, showing typical orders of sheared and blanked plates which By-Products supplies on short notice. In the background are two of the many available machines. If you use or could use sheared, blanked or pressed steel plates, By-Products can probably save you money. Send for the By-Products bulletin.



Above . . . A group of typical sheared plates produced by the By-Products division. Special equipment permits accurate shearing of many pieces that would seem to require dies. The saving is the buyer's, of course. On all pieces, By-Products deducts the value of scrap, the buyer saves the freight on scrap and avoids all scrap return.



Above . . . Another group of blanked pieces produced by the By-Products division of Lukens. By-Products has a wide assortment of dies available for your work. Perhaps some of these pieces may suggest a solution to your own problem.



Above . . . Some representative pressed shapes produced by the By-Products division, including boiler manholes, covers and fittings, tank hatches and collar flanges. Send your press work to By-Products for estimate and get acquainted with the economies you can effect.

LUKENS STEEL COMPANY

FIRST TO ROLL BOILER PLATE IN AMERICA

DIVISIONS

BY-PRODUCTS STEEL CORPORATION • LUKENWELD, INC.
COATESVILLE, PENNSYLVANIA

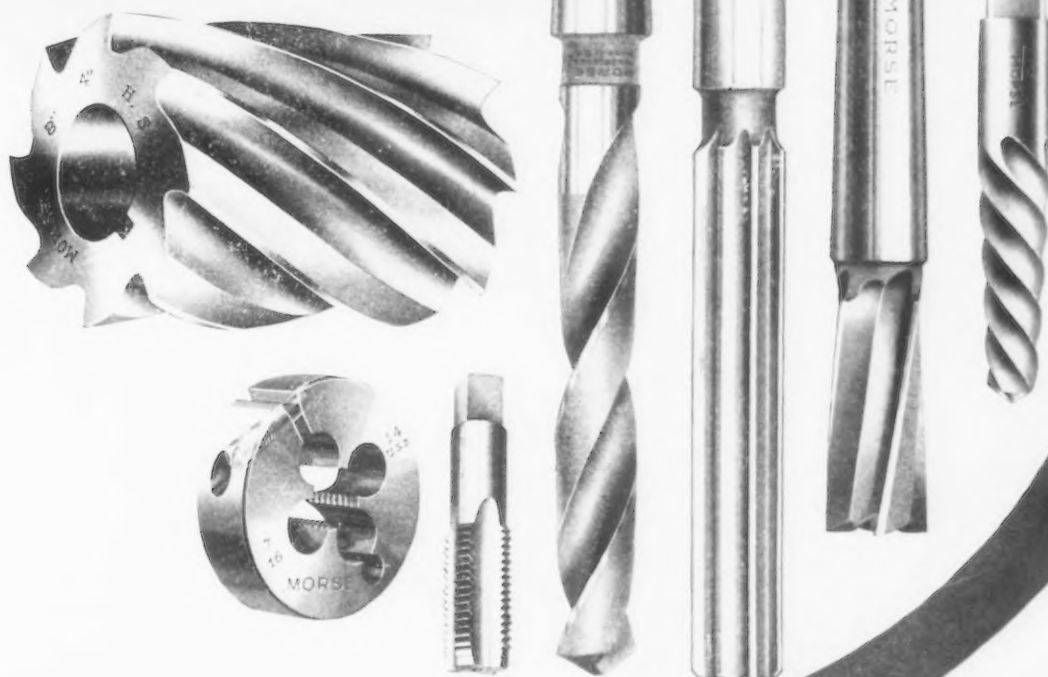
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TOOLS look a good deal alike at the start—but long hours of production work soon demonstrate what a difference there is.

Results show the value of careful steel selection, thoroughly mastered heat treating procedure, rigid adherence to accuracy standards. These are the reasons why Morse Tools are different. They work longer and faster between sharpenings. They bring your production costs down where they belong.

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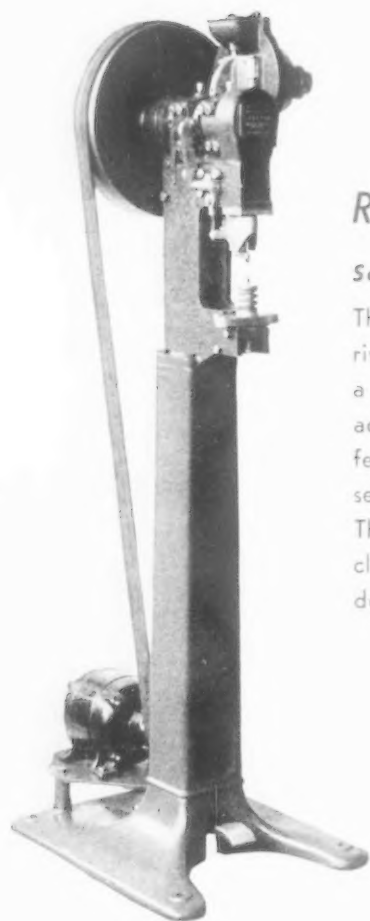
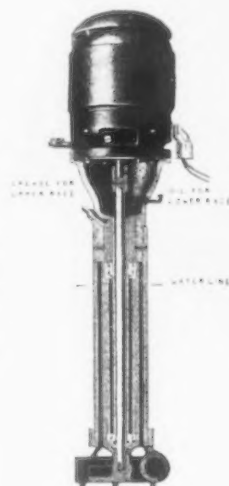
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EQUIPMENT

Air and Hydraulic Equipment use "HOPKINS"

Non-Rotating Cylinders in 6 standard styles, cushioned or non-cushioned, in all desired capacities. Also made to suit special installations. Rotating Cylinders in Series B and C (operating valve is integral with distributor in Series C, Series B requires an operating valve). A complete line of 2 and 3 Jaw Chucks, also Compensating Jaw types. Satisfaction is guaranteed in "HOPKINS" Equipment.

Coolant Pumps specify "BROWNIE"

A centrifugal pump with ball bearings within one inch of the impeller. No packings to leak. No screen to clog. Entirely self-aligning. "Open" types (for setting on bottom of tank) and "closed" types (for mounting on outside of tank) 10-100 G.P.M. This pump handles anything from coolant, impregnated with grit and chips, to oil.

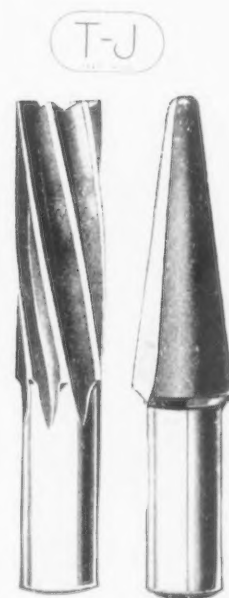


Riveters say "THE RIVITOR"

The machine that automatically feeds and sets rivets with as much speed as tubular rivets, and a 10% to 19% gain in the strength of the joint accomplished. The DUPLEX—punches, then feeds and sets rivets. The SIMPLEX—feeds and sets rivets in holes punched in previous operations. The CLINCH NUT MACHINE—feeds and sets clinch nuts. Let us submit samples of your work done in the "RIVITOR" method.

Die Sinking Milling Cutters select "T-J"

Available in 5 standard styles. Special cutters also made to your order. Cutters are low in cost, built of best-grade high speed steel—fully guaranteed.



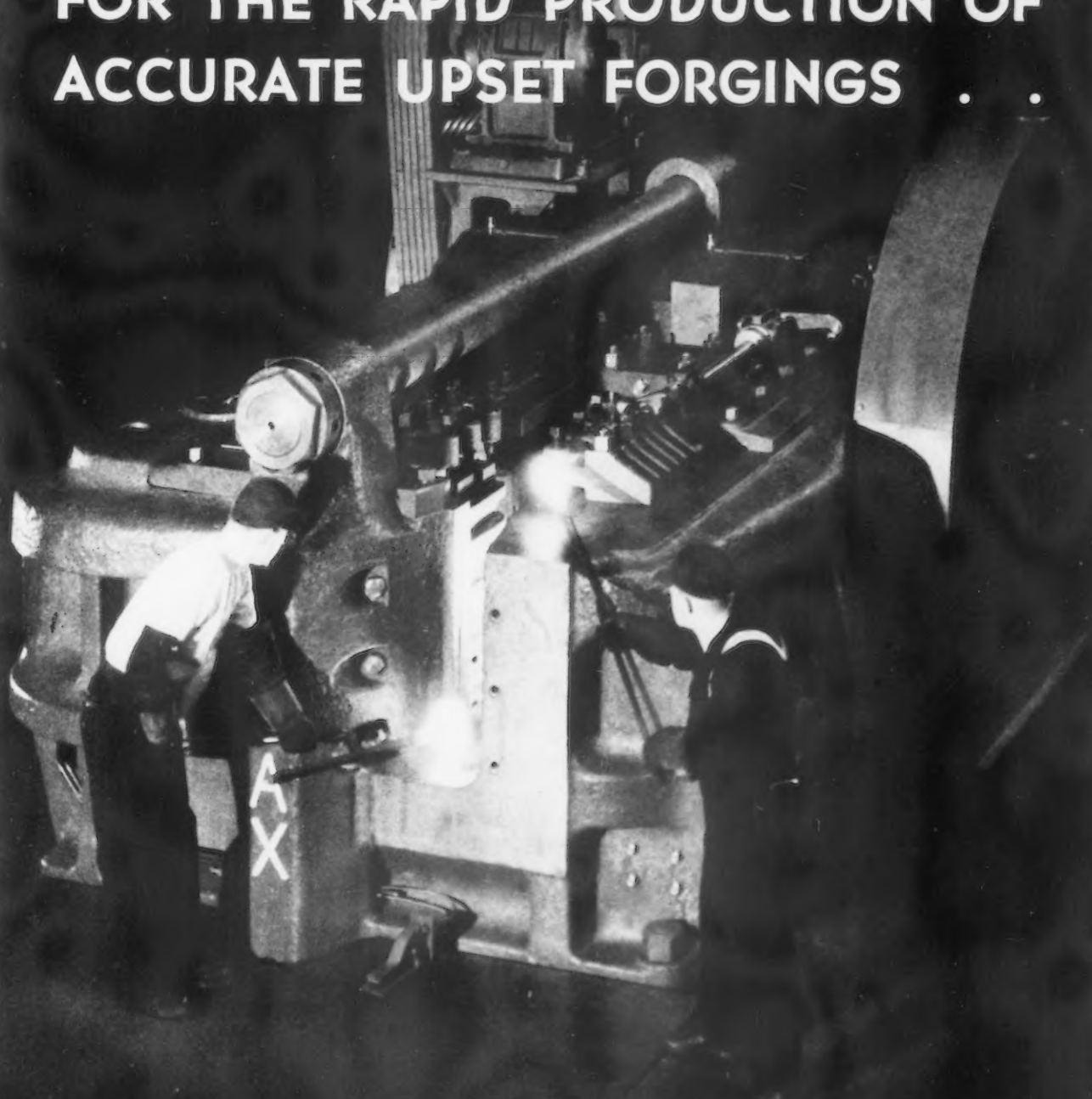
Write for further information. You should acquaint yourself with the outstanding features and highly efficient performance of these tools. We shall be pleased to send you additional data on this equipment, or on special equipment, in these lines, to suit your installation.

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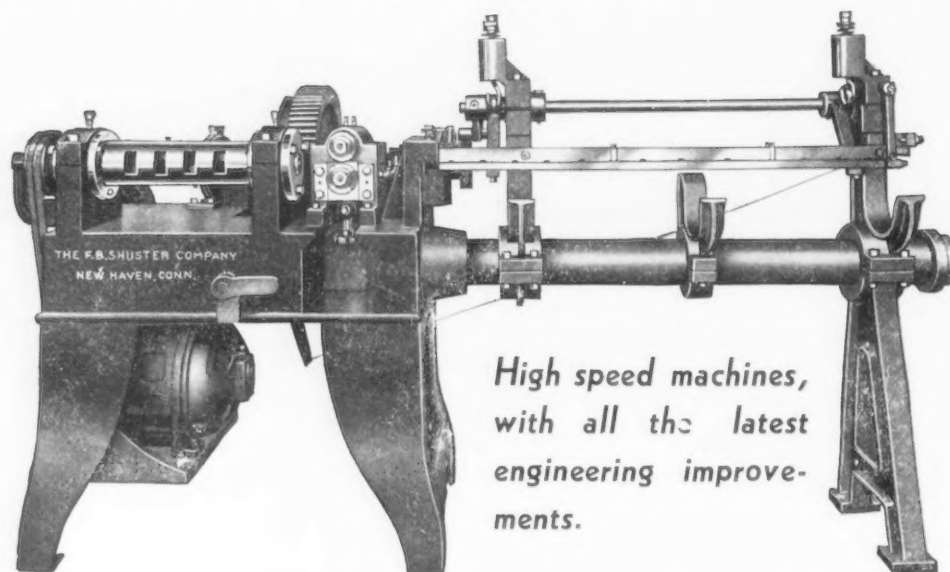
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Automatic Wire Straightening and Cutting Machines



*High speed machines,
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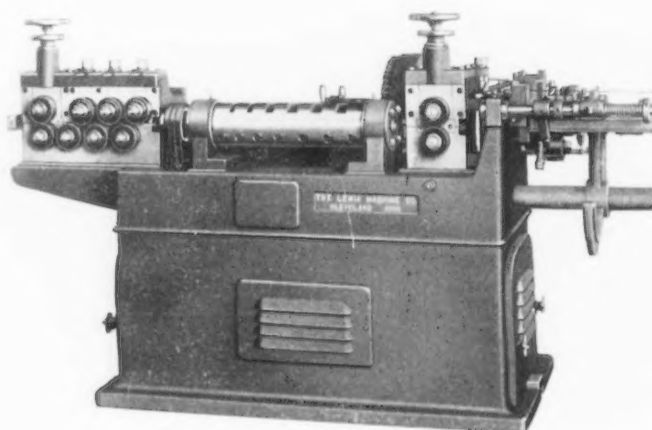
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Straightener Specialists Since 1866

REPLACE OBSOLETE EQUIPMENT
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Built like modern machine tools, these high-speed LEWIS Wire Machines have greatly increased production in many up-to-date wire mills. They are equipped with anti-friction bearings throughout, fully enclosed gear housings, and quick-action cut-off.



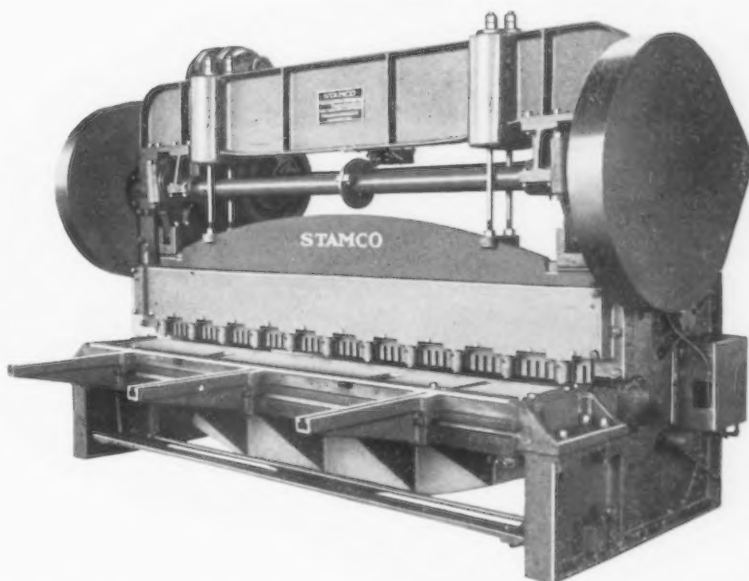
BUILT IN SIZES $\frac{1}{8}$ " TO $\frac{3}{4}$ " CAPACITY
WRITE FOR BULLETIN No. 633

*Many plants have increased production
over 100% on wire straightening and
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Machines equipped with variable speed
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Features

Flywheel type multiple disc air cooled friction clutch mounted on Timken Roller Bearings and controlled by either foot pedal or push button control.



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Improved hold-down, new bed and cutter bar designs. Drive shaft mounted on Timken Roller Bearings. Twin drive on eccentric shaft.

NEW STAMCO SHEAR

The Streine Tool & Manufacturing Company, manufacturers of Stamco Plate and Sheet Metal Working Machinery, have incorporated in the design of all Stamco equipment, the clutches and gearing which have been in use on Minster Presses for many years.

With the new designs on hold-down, bed and cutter bar and with the addition of the excellent Minster features, STAMCO SHEARS provide better shearing, smoother operation and less power and upkeep cost. Write for further details.

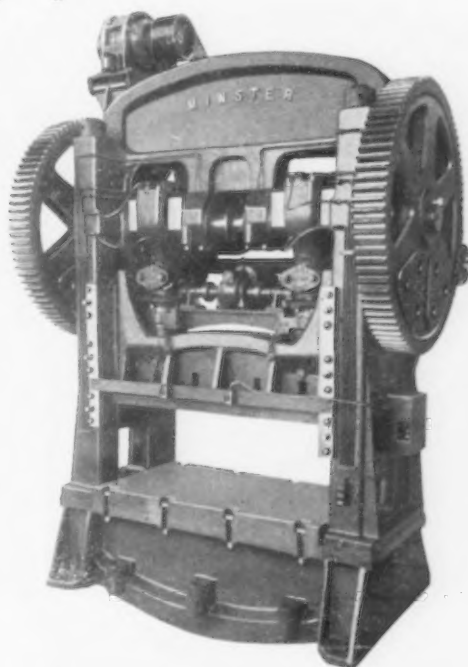
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The complete line of

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offers a degree of adaptability to plant conditions, methods and production which makes a strong appeal to good management.

The illustration to the right features a Minster Double Crank Straight Side Press equipped with the flywheel type, multiple disc, air cooled friction clutch having the Electric-pneumatic control, double gearing and twin drive. Note: This Press presents a very compact and simplified design which reduces floor space materially. The drive shaft as well as the friction clutch is mounted on Timken Roller Bearings.



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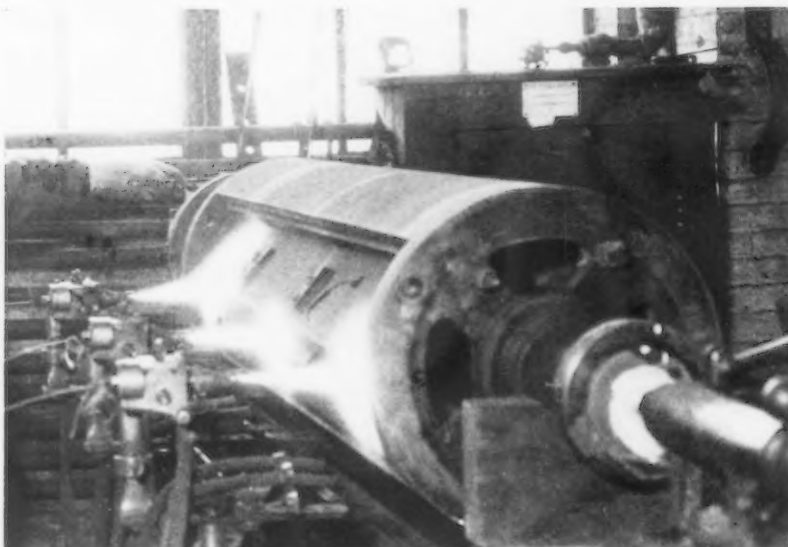
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The Engineering staff of this Company includes several pioneers in the field of industrial metal spraying. Their recommendations will

effect savings in your plant as they have in hundreds of others in all kinds of industries. Write for descriptive brochure on the Sprayed Molten Metal Coating Process. Mail blueprints for quotation on machine work.



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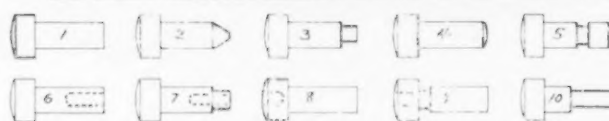
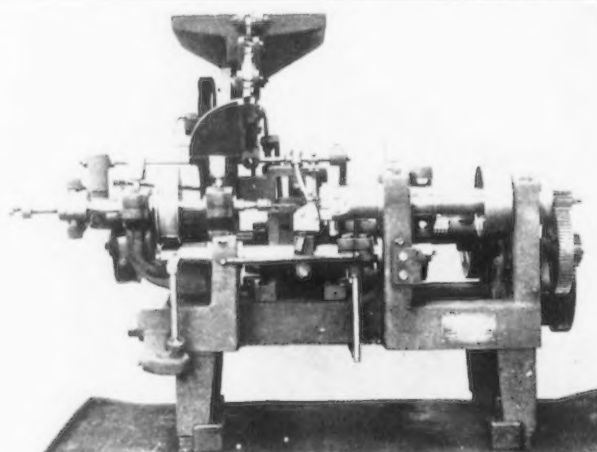
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These machines are designed to overcome distortion of the work; also breakage in riveting porcelain, hard rubber and carbon brushes. The swinging foot lever gives an easy action for the operator. Light blows as fast as 200 per secondpeen the heads into shape very quickly, giving extreme security and accuracy for the finest requirements. Riveting can be done in holes and close to shoulders. They handle rivets and tubes up to 5/16" diameter.



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DO YOUR STAMPINGS MEASURE UP TO THIS ACCURACY?

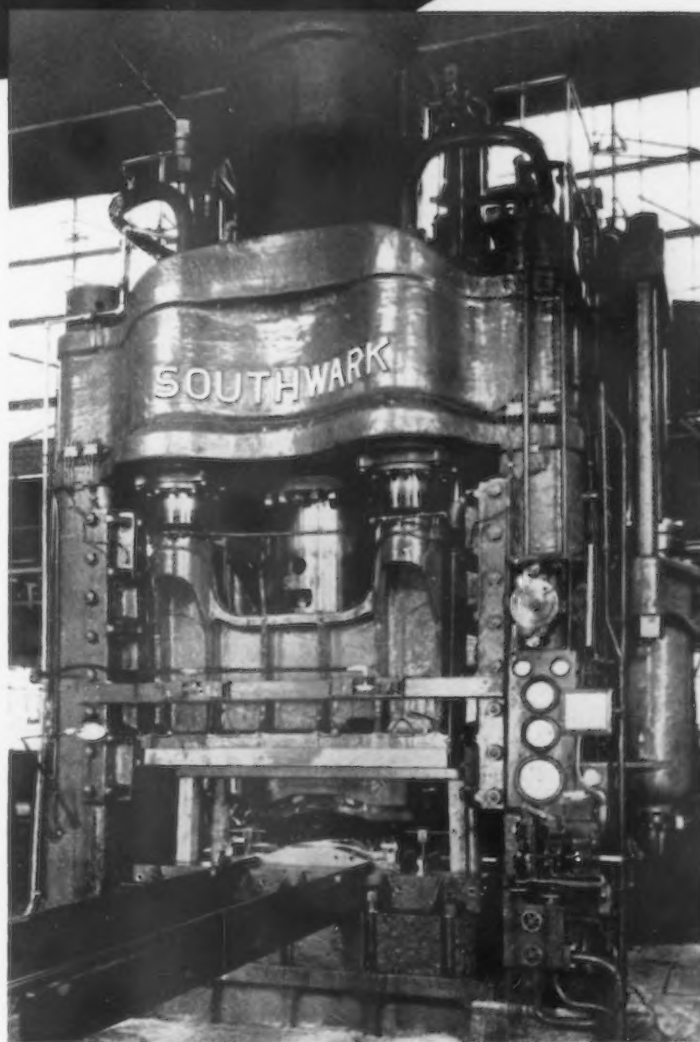


Illustrated is a heavy stamping picked at random from regular production of a Southwark High Speed Hydraulic Press at the plant of a large automobile chassis manufacturer.

Note the widely separated parallel surfaces on this stamping—indicating a perfectly set product with no "spring back."

Look into this hydraulic press that has, in some cases, exceeded the production of mechanical presses of the same size and producing the same piece by as much as 70% . . . that requires no accumulators or other auxiliary hydraulic equipment . . . that reduces the cost of die development, makes die-setting much easier and safer and greatly increases die-life . . . that reduces rejects and returns for repressing.

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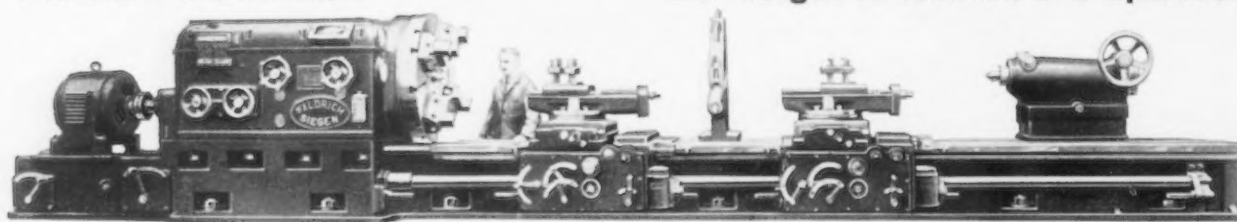
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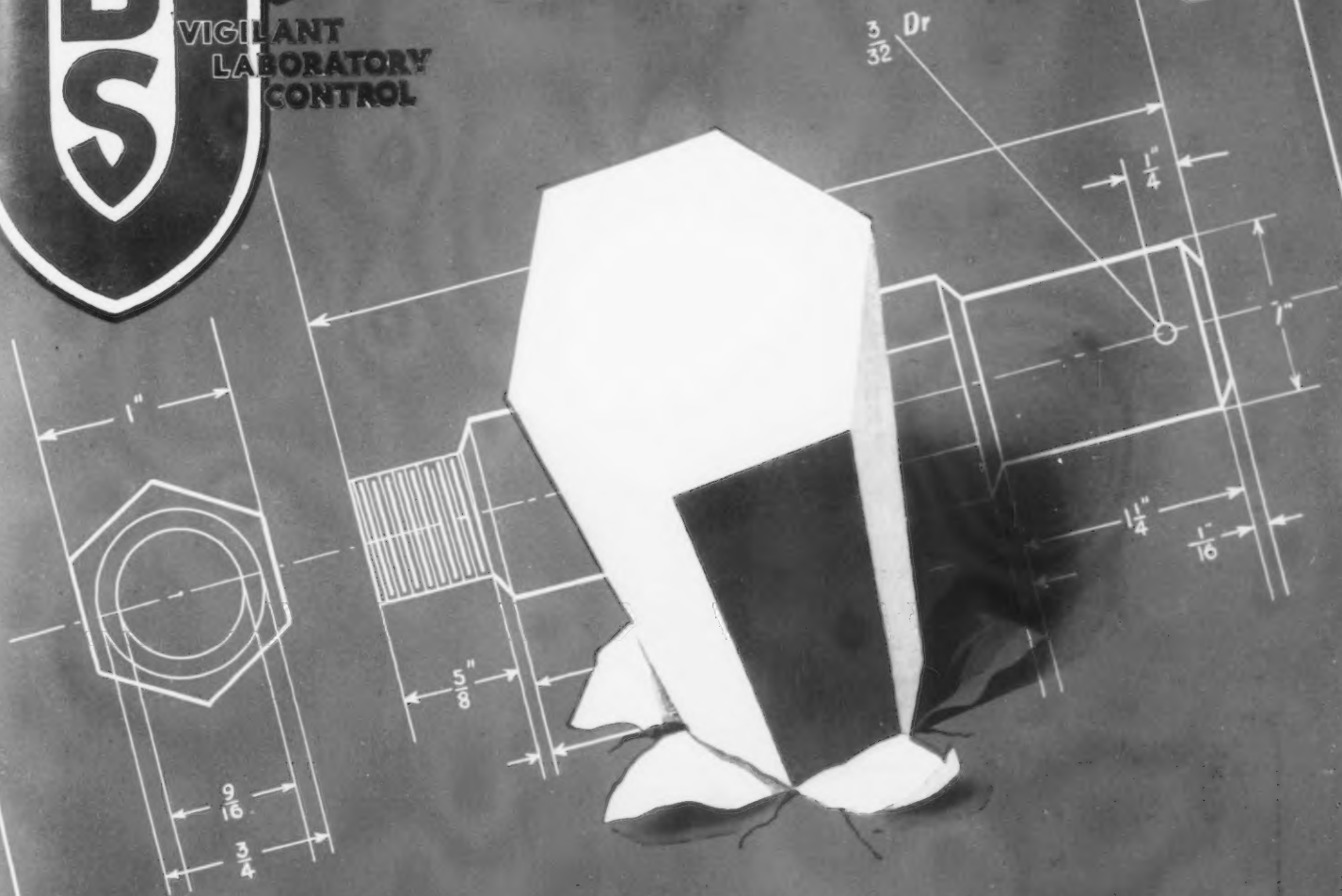
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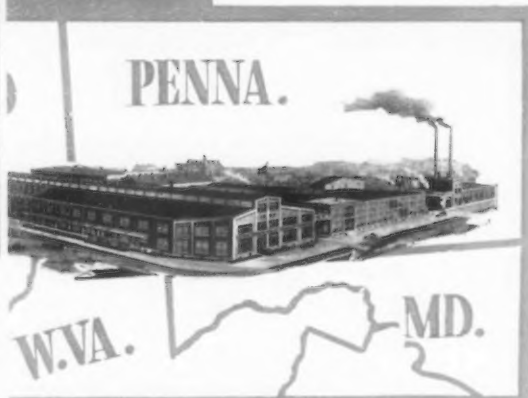
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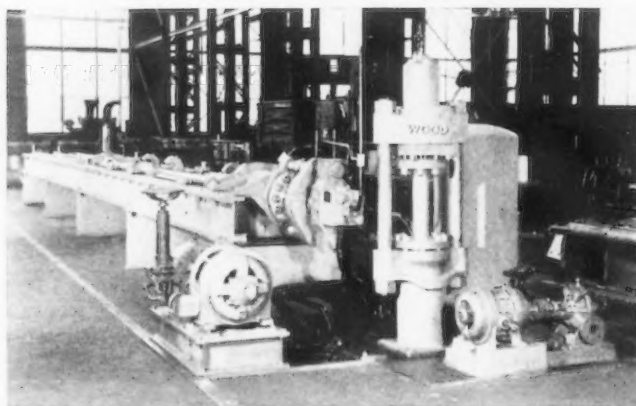
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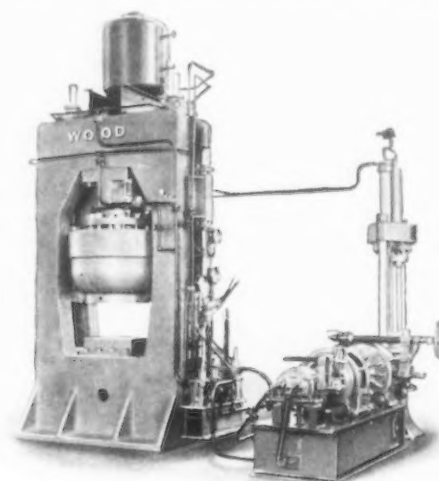
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Hydraulic tube testing machine for testing tubes from 1" to 5" diameter, up to 40 ft. length and 10,000 lbs. test pressure.



1000 ton die sinking press with variable pressure pumping unit.



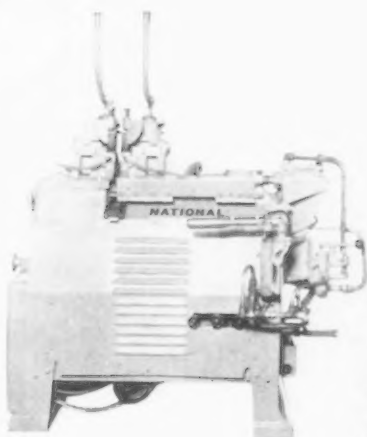
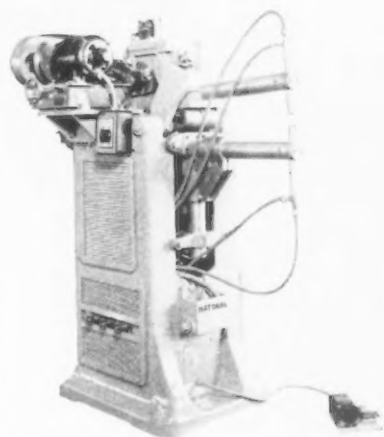
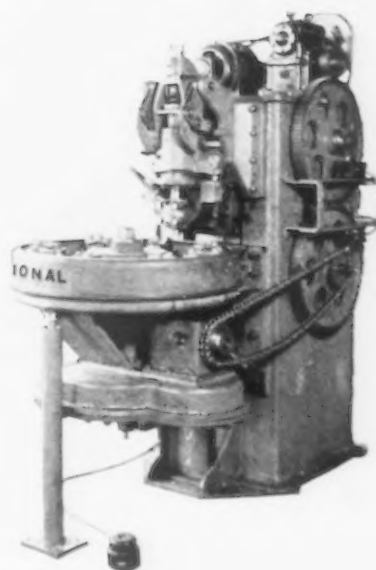
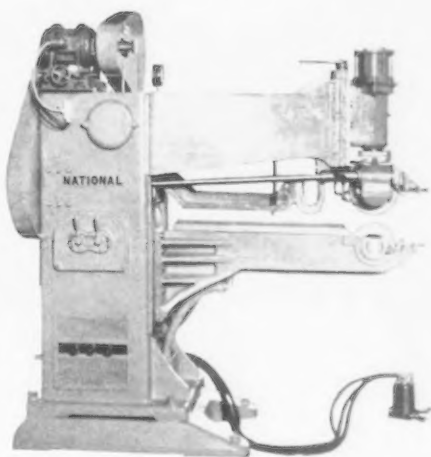
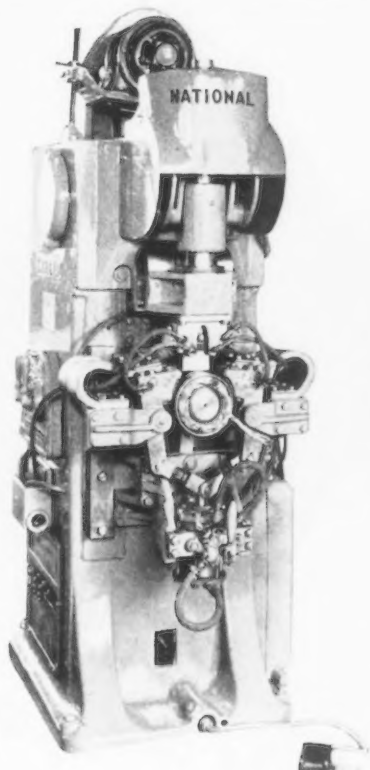
2000 ton special forming press with welded steel plate housing. Working pressure — 10,000 lbs. per sq. in.



Hydraulic press and pumping unit for forming solid CO₂ cakes.

The few machines shown above are typical products of modern times—designed to meet the most specialized of modern requirements, and evolved by a capable engineering staff to fit ever-changing manufacturing methods and processes. They, like all R. D. Wood machinery, are the embodiment of progress. We are specially equipped to build hydraulic presses, accumulators, operating valves, etc., for boiler shops, plate shops, car shops, railroad shops, forge shops, steel mills, ship yards, foundries, automobile plants, powder mills, brass and copper works, and for the manufacture of rubber, fibre, bakelite, and other plastic products. Have you a problem involving the use of hydraulic machinery, or do you want further information? If so, please get in touch with us. Our answers are prompt and to the point.

R. D. WOOD CO.
400 CHESTNUT ST., PHILADELPHIA, PA.



*Wishing You All Happiness and
Prosperity throughout the New Year*

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ELECTRIC WELDING MACHINES COMPANY

1846-60 N. TRUMBULL STREET

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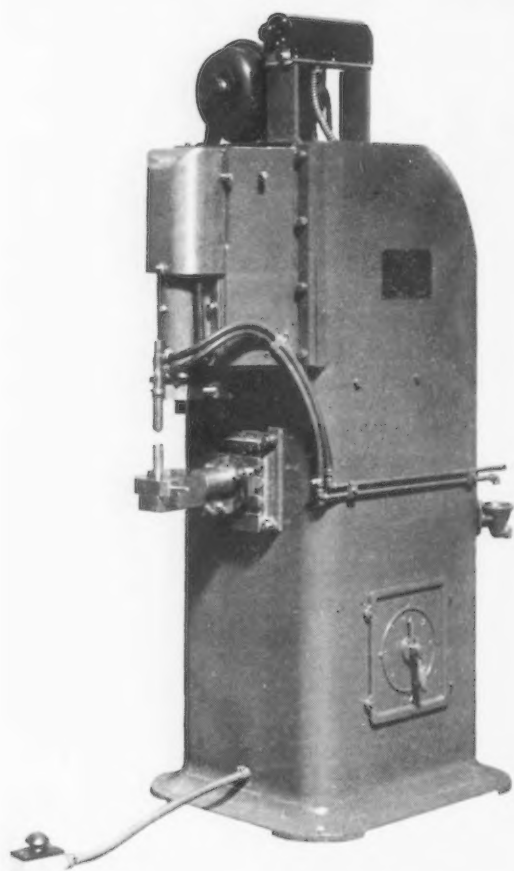
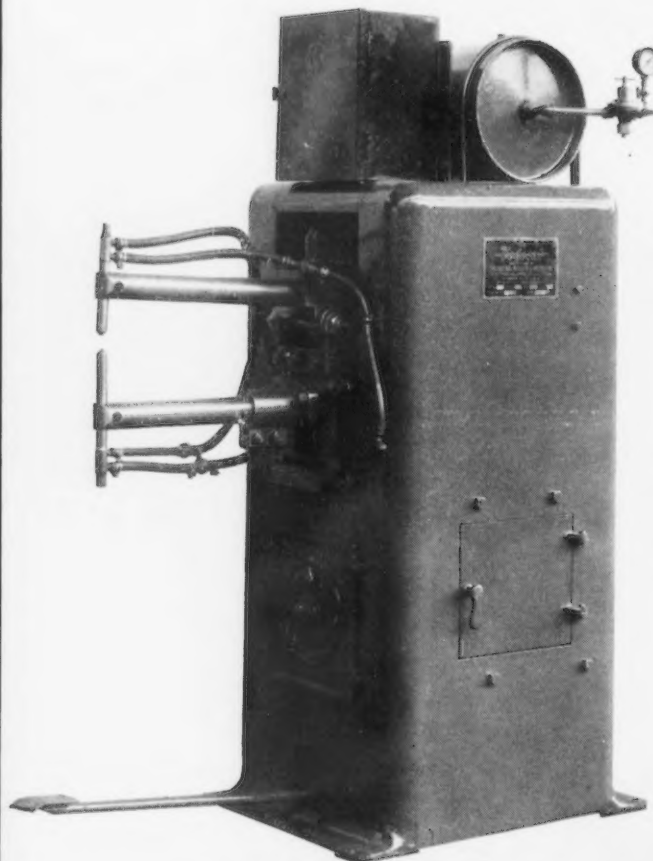
Federal

"200 SERIES"

AIR OPERATED

SPOT WELDERS

for
ECONOMICAL
CONTINUOUS
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DESIGNED to spot weld medium class of sheet metal work on continuous production, the 200 series air operated Federal Spot Welders require but a minimum of attention. Low first cost and low cost of operation are outstanding advantages.

Throat depth up to 30 inches. Four-speed control mechanism provides 40-60-80 and 100 spot welds per minute. Lower and higher welding speeds available on request. Conductor arms may be rotated in their sockets.

Welding capacity is from very light gauges up to two pieces of 9/32" metal with 50 KVA transformer. Air pressure by customer is 60 to 80 lbs. per square inch. Weld timer assures uniform results.

We also illustrate the Federal motor driven Press Type Welder having a welding speed of 50-75-100 and 150 strokes per minute. With a 50 KVA transformer at slow speed and short throat depth its capacity is two pieces of 9/32" metal spot welded and 8 projections to 16 gauge stock.

The entire frame is of welded steel construction, and both of these sturdy welders are giving a good account of themselves in production service.

The Federal Machine & Welder Co.

ELECTRIC WELDERS OF ALL TYPES

Factory and Home Offices: Warren, Ohio

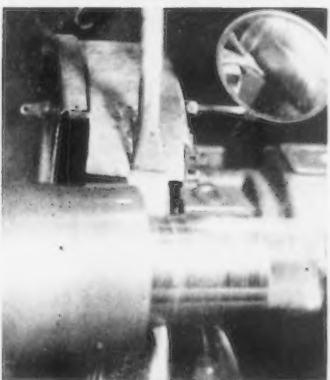
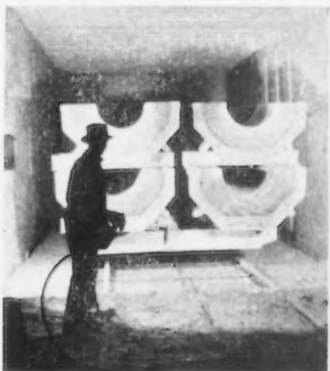
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MARK of



QUALITY



From laboratory to shipping room—every operation in the manufacture of Phoenix Rolls is based on the best steel practice. The difference between Phoenix rolls and others lies in their performance. Exact knowledge of how each of the many varieties of rolls must perform in service and how to make rolls for each performance specification, is the reason for the amazing preference for Phoenix Rolls among the army of men whose life work is devoted to rolling steel and other metals.



PHOENIX Steel
For unusual strength.

PHOENIX "A" (Steel Alloy)
For strength and wear.

PHOENIXLOY (Uniformly Hard)
For flat rolling where high finish
of extremely thin gauge material is
required to be free from all marks
or defects.

PHOENIX Metal (Iron Alloy)
PHOENIX "K"
For strength, wear and finish.

PHOENIX Chill
PHOENIX Nickel Chill
For all flat rolling requiring finish.

Also Tube Mill Rolls of quality material
best suited to the kind of service
required.

PITTSBURGH ROLLS CORPORATION

PITTSBURGH, PA.

THE LATEST IN 3 HIGH SHEET MILL EQUIPMENT

Lewis brings out this new feature in Three High Sheet Mill Equipment.

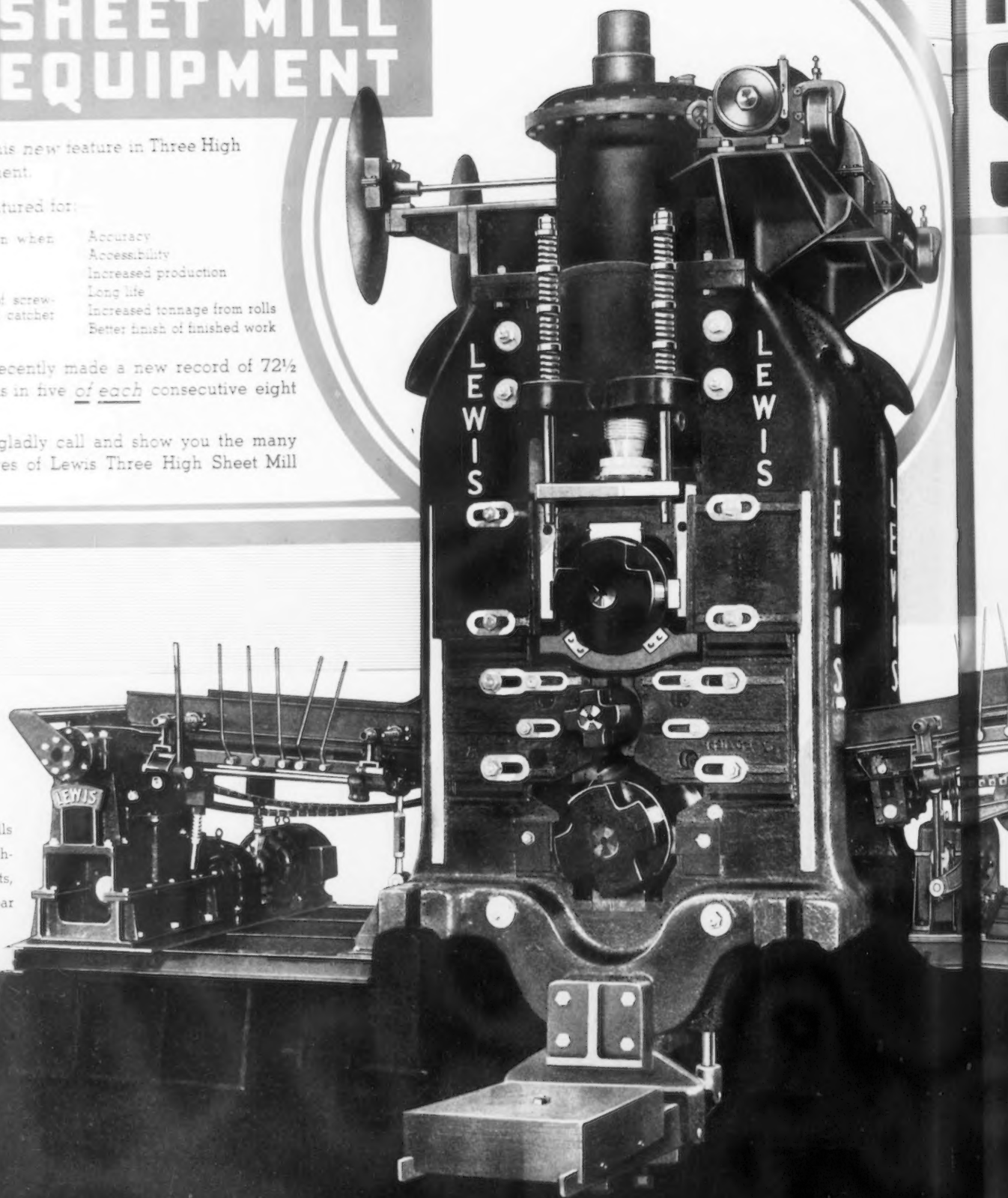
These mills are featured for:

Automatic screwdown when specified	Accuracy
Simplicity	Accessibility
Independent control of screw-down and feeder and catcher tables.	Increased production
	Long life
	Increased tonnage from rolls
	Better finish of finished work

One Lewis Mill recently made a new record of 72½ tons of breakdowns in five of each consecutive eight hour turns.

An engineer will gladly call and show you the many detailed advantages of Lewis Three High Sheet Mill Equipment.

Lewis Three High Mills are furnished for finishing full finished sheets, or roughing sheet bar or strip breakdowns.



LEWIS FOUNDRY & MACHINERY CO.

AUTOMATIC SCREWDOWN

LEWIS FOUNDRY & MACHINE CO.

(A SUBSIDIARY OF BLAW-KNOX COMPANY)
PITTSBURGH, PENNA.

LEWIS FOUNDRY & MACHINE CO.
UNION STEEL CASTING CO.
NATIONAL ALLOY STEEL CO.
PITTSBURGH ROLLS CORP.

CABLE ADDRESS
BLANKING PITTSBURGH
CORDER, BENTLEY, LEBENS
WESTERN UNION

TO THE ENGINEERS IN THE ROLLING MILL INDUSTRY

Gentlemen:- The Lewis Foundry & Machine Company is at the present time building three (3) Three-High Mills; one for finishing wide full finished sheets and two for roughing of sheet bars to breakdowns.

This advertisement shows the type of Mill that LEWIS is building in Australia and also in Canada.

This Mill is complete with Double Motor Operated Screwdown, arranged for accurate adjustment of reduction on each pass and automatic balancing of top and middle rolls to prevent the slapping of rolls when material is entered.

This type of Mill was developed by the Lewis Foundry & Machine Company some three years ago. Several companies have adopted it. One Consulting Engineering firm has also adopted this method of making breakdowns for a foreign installation.

We have found by actual experience, that complete automatic control of the Mill is entirely too slow. The electrical control which has been developed controls the screwdown and tables independently and has produced excellent results.

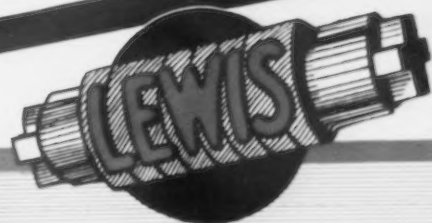
One of these Mills just recently made a new record of 145,000# or 72-1/2 tons of breakdowns in five of each consecutive 8-hour turns, and we can depend on this Mill to consistently keep up this production. We have every reason to believe that as the men become experienced in operating and handling these Mills, that tonnages as high as 95 to 100 tons will be attained.

These Mills are also equipped with positively driven top rolls.

Yours very truly,

LEWIS FOUNDRY & MACHINE COMPANY
F. A. Beatty
Chief Engineer.

FAB:MM



& MACHINE CO.

PITTSBURGH, PA.

"NATIONAL" ROLL



CHILLED ROLLS FROM 10" TO 36" DIAMETER

ROLLING MILL MACHINERY

SPECIAL CHILLED ROLLS
SAND ROLLS

ROLLS

PLAIN CHILLED ROLLS
COLD ROLLS

EXTRA HARD ROLLS FOR BRASS, COPPER, ALUMINUM, ZINC

SPECIAL CONTACT ROLLS FOR FOUR-HIGH MILLS

The National Roll & Foundry Company

Office and Works: AVONMORE, PA., U. S. A.

Your Source of Supply

for anything and everything needed in



OXYGEN, ACETYLENE
NITROGEN, HYDROGEN

WELDING and CUTTING
APPARATUS and SUPPLIES

TWO-STAGE REDUCTION
OXYGEN and ACETYLENE
PRESSURE REGULATORS

PORTABLE WELD TESTING MACHINE
for Tensile and Bend Tests

PORTABLE PIPE CUTTING
and BEVELING MACHINE

GAS CUTTING MACHINES

AIRCO-NATIONAL CARBIDE
Carbide Flare Lights and Lanterns

AIRCO-WILSON
ELECTRIC WELDING MACHINES
ELECTRIC WELDING RODS

STOODY PRODUCTS for HARD FACING

SIL-FOS
The LOW MELTING POINT
BRAZING ALLOY

GAS or ELECTRIC WELDING

and

HAND or MACHINE GAS CUTTING

With OFFICES and PLANTS in the important centers of the country, AIRCO offers to all users of welding and gas cutting, a service that is complete and satisfying from every angle. Go to AIRCO for your answer to any question pertaining to welding and gas cutting, for your equipment, apparatus and supplies, for practical aid in training your welders and cutters, and for full engineering cooperation on any welding or gas cutting problem.

AIR REDUCTION SALES COMPANY

GENERAL OFFICES: 60 EAST 42ND ST., NEW YORK, N. Y.

DISTRICT OFFICES

Baltimore
Bettendorf, Iowa
Birmingham
Boston

Buffalo
Charlotte
Chicago
Cincinnati

Cleveland
Dayton
Detroit
Jersey City

Kansas City, Mo.
Los Angeles
Louisville
Milwaukee

Minneapolis
New Orleans
Oklahoma City
Philadelphia

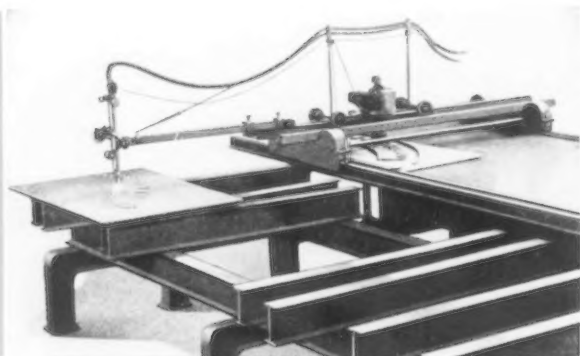
Pittsburgh
Portland, Ore.
Richmond
San Francisco

Seattle
Shreveport, La.
St. Louis
Wheeling

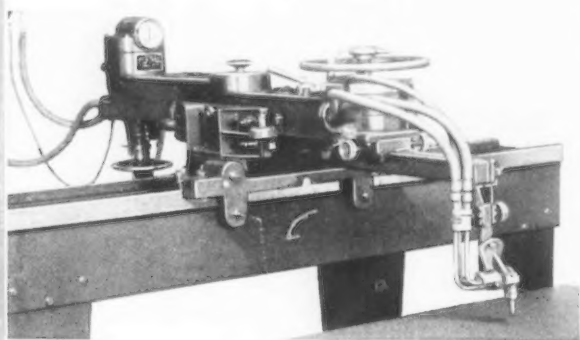
Represented in Texas by Magnolia Airco Gas Products Co., Houston, Beaumont, Wichita Falls, El Paso, Fort Worth and San Antonio
Represented in Canada by Railway & Engineering Specialties, Ltd., Toronto, Montreal, Winnipeg

A NATION-WIDE WELDING and CUTTING SUPPLY SERVICE

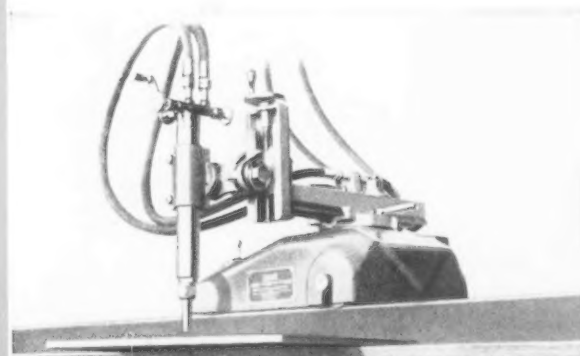
For Every Cutting Need— Meet the Demands



The Oxweld Shape-Cutting Machine provides a rapid, accurate and economical means of shaping steel parts.



The Oxweld "Pantosec" is compact. It is ideally suited for production cutting of smaller pieces. Many attachments make possible a wide variety of money-saving uses.



Automatic Straight-Line Cutting, with or without beveled edges, is an easy job for the Oxweld "Monitor". It will operate continuously and always make clean, smooth cuts in the work.

Oxy-acetylene machine cutting has become an important factor in industrial production schedules for the shaping of steel parts. Manufacturers are turning to oxy-acetylene machine cutting because this method of fabrication is a vast improvement over older metal-working methods. Oxweld cutting machines compare favorably in precision of operation with the finest machine tools. These machines are capable of making cuts in steel of such quality and accuracy that for many purposes little or no finishing is required. Practically every cutting requirement is covered by the wide assortment of oxy-acetylene cutting machines in the Oxweld line.

Oxweld Automatic Shape-Cutting Machine

The Oxweld Shape-Cutting Machine is designed for large scale production cutting of regular or irregular shapes from steel sections of almost any size, thickness or complexity of outline. It is particularly adaptable where the same pattern or design is to be cut repeatedly. An outstanding feature of this machine is its great flexibility.

Oxweld Pantosec Cutting Machine

The Oxweld "Pantosec", a compact oxy-acetylene cutting machine designed for permanent installation, permits universal movement of the blowpipe in a horizontal plane. The working range of the Pantosec is 20 x 44 in.

Oxweld Monitor Cutting Machine

The Oxweld "Monitor" fits the needs of a large field of everyday production—automatic straight-line, bevel, circle and ring cutting, plate edge preparation, and the cutting of curved or irregular shaped pieces. It is rugged and will remain accurate over a long and useful life. It weighs only 95 lb. complete with one blowpipe.

Oxweld Secator Cutting Machine

The Oxweld "Secator" (not illustrated) is a small motor-driven cutting machine for portable use. It weighs but 43 lb. The machine rests directly on the work and can be guided by hand to follow a pattern along the line to be cut.

Oxweld Cutting Machines of INDUSTRY

Oxweld Straight-Line Cutting Machine

The Oxweld Straight-Line Cutting Machine is used for straight-line cutting, with or without beveled edges. It makes clean and smooth cuts.

Oxweld Pipe-End Cutting and Beveling Machine

The Oxweld Pipe Beveling Machine is a simple, hand-driven mechanism for beveling open end pipe. It makes clean, smooth cuts at a great saving of time and labor. It is adjustable to cut any size pipe from 8-in. to 24-in.

Wagner Pipe Cutting Machine

The Wagner Pipe Cutting Machine is used for cutting and beveling pipe in the taking up and reclamation of old pipe lines.

Bring Your Cutting Problems to Linde

The nearest Linde Sales Office will be glad to send you a catalog describing these machines and advise how machine oxy-acetylene cutting can be adapted to meet your particular needs. These are located at Atlanta—Baltimore, Birmingham, Boston, Buffalo, Butte—Chicago, Cleveland—Dallas, Denver, Detroit—El Paso—Houston—Indianapolis—Kansas City—Los Angeles—Memphis, Milwaukee, Minneapolis—New Orleans, New York—Philadelphia, Phoenix, Pittsburgh, Portland, Ore.—St. Louis, Salt Lake City, San Francisco, Seattle, Spokane and Tulsa. Everything for oxy-acetylene welding and cutting—including Linde Oxygen, Prest-O-Lite Acetylene, Union Carbide and Oxweld Apparatus and Supplies—is available from Linde through producing plants and warehouse stocks in all industrial centers.

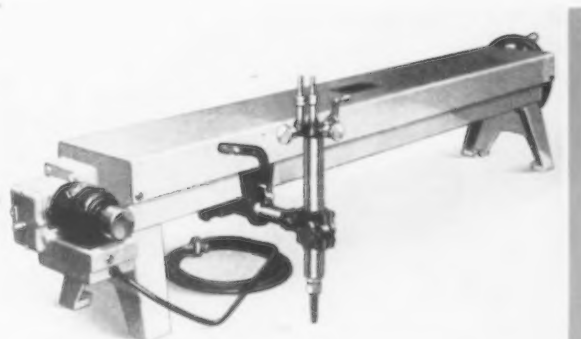


The Linde Air Products Company

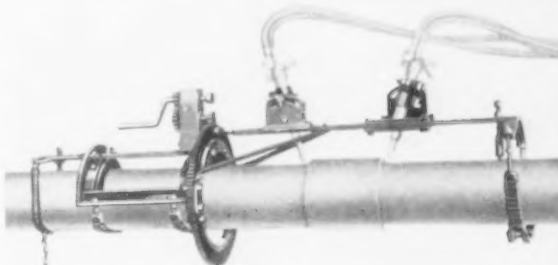
Unit of Union Carbide and Carbon Corporation



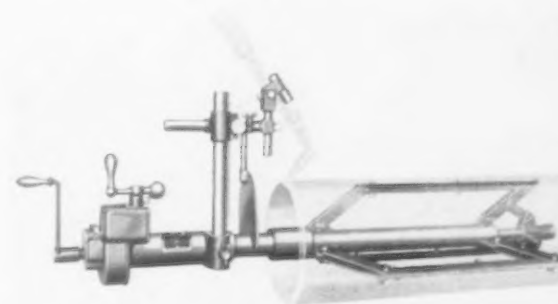
In Canada: Dominion Oxygen Co., Ltd. Toronto



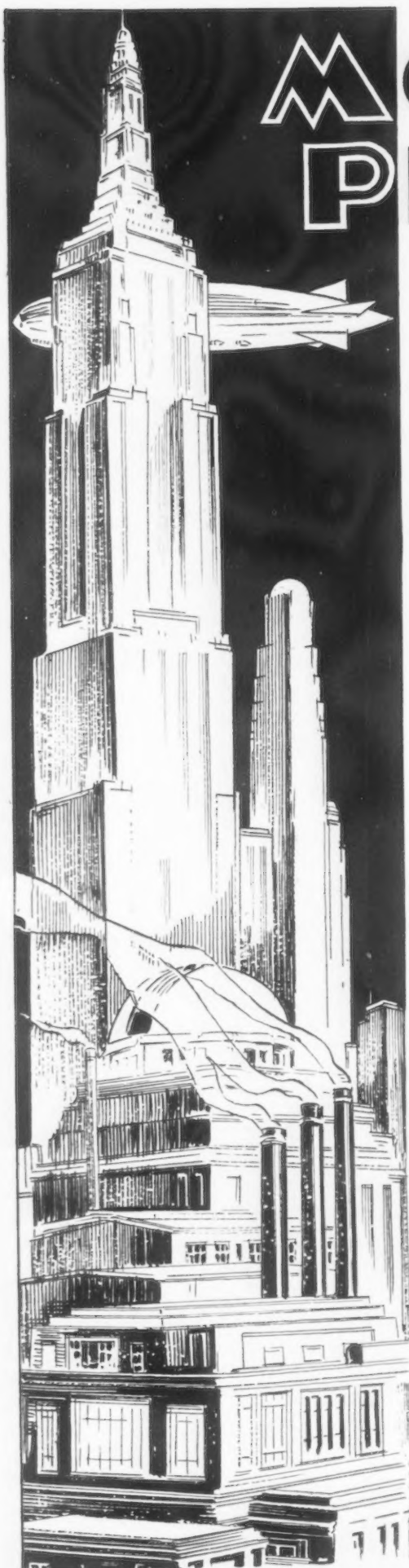
The Oxweld Straight-Line Cutting Machine is used for straight-line cuts with or without beveled edges.



Due to its unique principle of operation and sturdy construction, cuts made with the Wagner Pipe Cutting Machine are even in bevel and kerf throughout the circumference of the pipe.



The Oxweld Pipe-End Cutting and Beveling Machine makes clean, smooth cuts in any size pipe from 8 in. to 24 in.



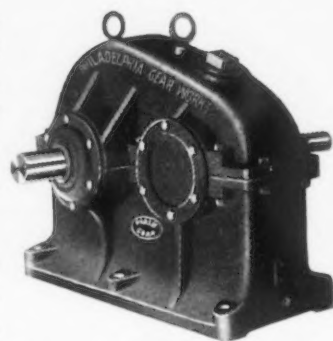
MODERN PRODUCTS

for the modernization of all industrial drives

Profits, today, depend largely upon low production costs. One sure way of lowering these costs is to operate with only the modern and efficient types of machinery. Equally important is the use of modern methods of driving this equipment.

The Philadelphia MotoReduceR is the ultimate in machinery drives. It combines in one compact housing the motor and speed reducer. Built in both horizontal and vertical types, the MotoReduceR is adaptable for driving all types of equipment. These units require no base plate or coupling between motor and reducer. Their compactness and ease of installation permit their being made an integral part of the machine itself.

Write us for further details about the MotoReduceR.



Philadelphia Herringbone Speed Reducer



Philadelphia
Horizontal
MotoReduceR



Philadelphia
Worm Gear
Reducer

For transmitting power economically from prime mover to driven machine, the Philadelphia Worm Gear Reducer meets all requirements for economical, trouble-free service. Write for information.

PHILADELPHIA GEAR WORKS

Industrial Gears and Speed Reducing Units

Main Office and Works—Erie Ave. and "G" St., Philadelphia, Pa.
New York—330 W. 42nd St. Pittsburgh—Chamber of Commerce Bldg.

HEAVY DUTY GEARS

*"from
stock"*

*ready for
immediate
shipment!*

Boston Heavy-Duty Gears will stand an unusual amount of severe service over a long period of time due to certain superior qualities inherent in the materials of which they are made. Also, they cost less than made-to-order gears of equal quality, and are, in many instances, far superior in design, materials, and workmanship.

A wide range of types and sizes makes it especially easy to select the right gear for the purpose. Large stocks are on hand at Boston Gear Service Stations located in the principal industrial centers of the country.

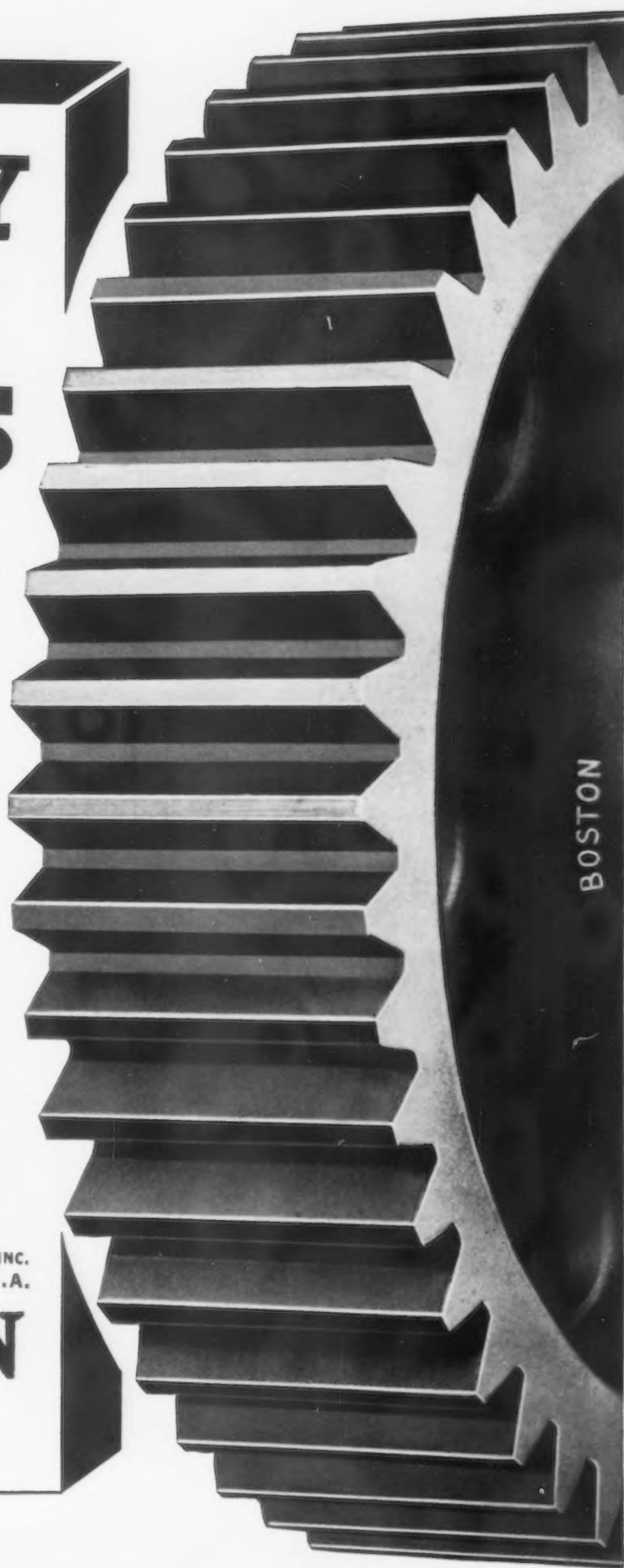
Send NOW for Catalog LA50

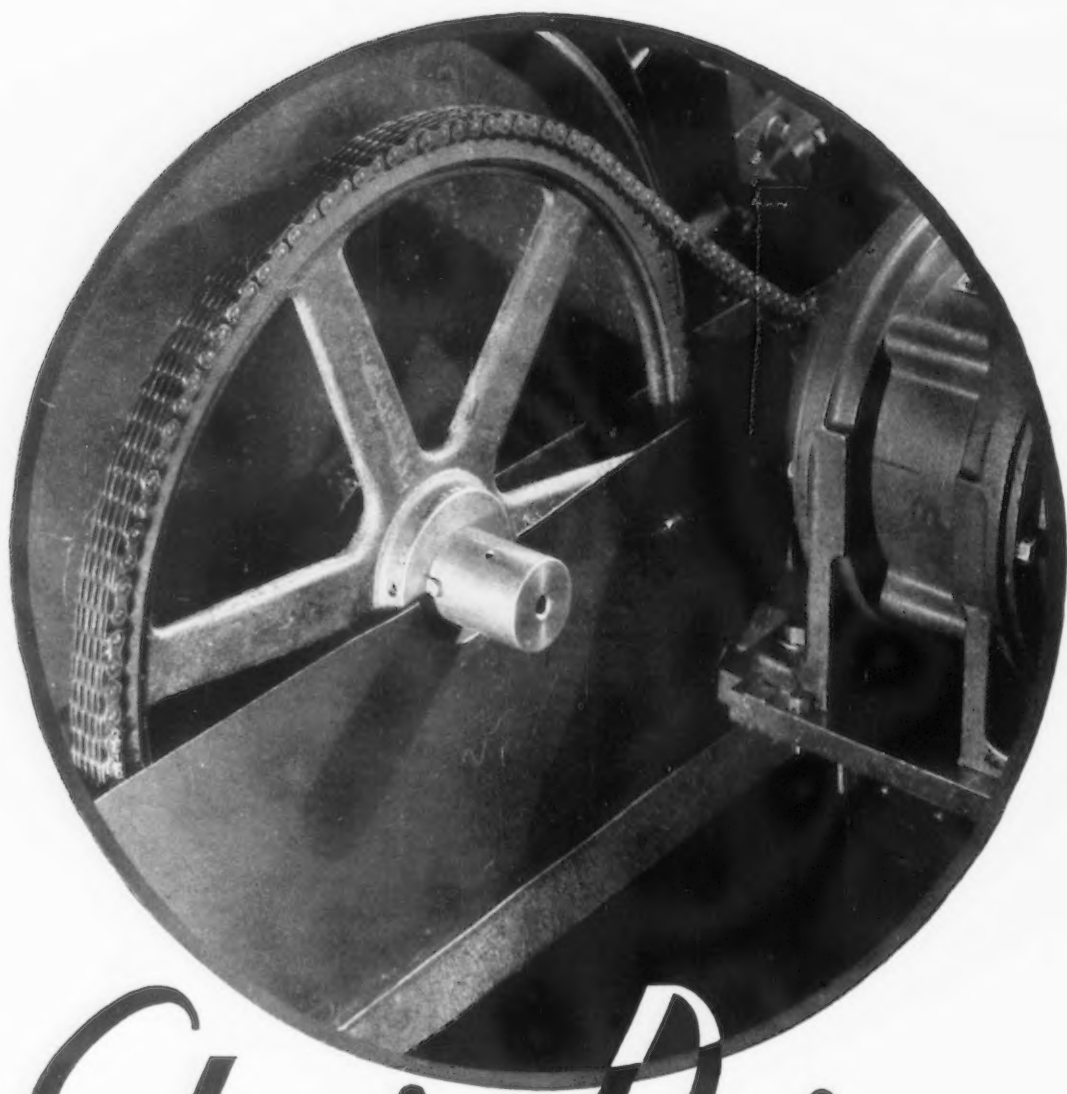
*We shall be glad to assist you in the
matter of recommendations*



BOSTON GEAR WORKS, INC.
NORTH QUINCY, MASS., U.S.A.

BOSTON GEARS





Chain Drives

meet today's power needs

INDUSTRY today, more than ever before, is studying the problem of putting power on the job. No longer is it satisfied to allow power transmission losses to take the profit out of production. The relative importance of group drives and unit drives are being compared not only from the standpoint of original cost, but on a basis of economy of operation.

Chain Drives have always had wide acceptance in industry where economy of operation has been essential. Their inherent characteristics are opposed to power losses, whether used as line shaft drives or unit drives.

Today, more than ever before, it will pay to consider chain drives in any power saving program.

THE WHITNEY MFG. CO., HARTFORD, CONN.

BOSTON CHICAGO CLEVELAND DETROIT PHILADELPHIA NEW YORK SAN FRANCISCO SYRACUSE

WHITNEY

There is **NO** substitute FOR SOUND ENGINEERING

THE DESIGN PRINCIPLES WHICH WON
UNIVERSAL RECOGNITION FOR THE FIRST
EFFECTIVE UNIT OIL SEAL ARE STILL THE
BASIS OF ITS LEADERSHIP



EVERY element illustrated here is manufactured by the Chicago Rawhide Manufacturing Company in its own plant and under its own complete control.

Specify Chicago Rawhide Seals for lubrication economy, longer bearing life and greater bearing efficiency.

1 LEATHER PACKING MEMBER accurately formed to correct inside diameter and taper—the only element which can come in contact with the shaft.

2 WIPING LIP effectively prevents passage of lubricant or the entrance of foreign matter.

3 TENSION SPRING exerting pressure at wiping edge holds packing member on the shaft and automatically takes up any wear. Shaft contact is thus maintained even with shaft misalignment. Spring tension scientifically developed for speeds and pressures of the individual application.

4 OUTER CUP encloses the entire assembly in one solid unit for a close press fit into housing assembly.

5 INNER SHELL carries sharp bosses which penetrate the leather of the packing member to prevent its rotation with the shaft—an exclusive feature of the "Perfect" Oil Retainer.

6 LUG on the cover washer drops into a notch in the inner shell to further prevent rotation of internal members.

7 INNER SHELL properly spaces cover washer and the flange of the packing member to permit free action of the tension spring.

8 FOOT OF INNER SHELL positively clamps flange of packing member in the outer cup.

THE CHICAGO RAWHIDE MANUFACTURING COMPANY

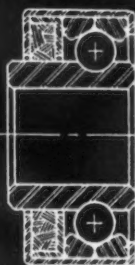
1308 ELSTON AVENUE • CHICAGO, ILLINOIS

53 YEARS MANUFACTURING QUALITY MECHANICAL LEATHER GOODS EXCLUSIVELY

NEW YORK PHILADELPHIA PITTSBURGH DETROIT CLEVELAND CINCINNATI BOSTON



"Commercial" Annular Ball Bearings are used in hundreds of different kinds of machines and mechanical devices.



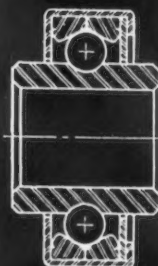
TYPICAL INSTALLATION

"Commercial"

They are not restricted to a few industries. It is this wide diversity of service that has developed for these bearings a nation-wide demand which extends into every line of commercial endeavor.

Therefore, no matter what you make, nor the type of manufacturing machinery you use — there is a "Commercial" Annular Ball Bearing exactly suited to your needs.

"Commercial" Annular Ball Bearings have a dual thrust capacity; speeds up to 2500 R.P.M.; a larger number of balls; obtainable in standard sizes or made to meet your requirements.



TYPICAL INSTALLATION

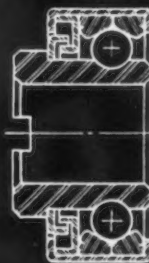
ANNULAR BALL BEARINGS



Here are all the essential features of a good bearing and the cost is often less than you are asked to pay for inferior bearing service. Write us for complete information.

THE SCHATZ MANUFACTURING CO.
POUGHKEEPSIE, N. Y.

Detroit Sales Office: 2608 Book Tower
Chicago Sales Office: 120 N. Peoria St.



TYPICAL INSTALLATION

The
WEAN ENGINEERING
Company, Inc.
Warren, O.

AND ITS ASSOCIATE COMPANIES

The FLINN & DREFFEIN CO.

The MCKAY MACHINE CO.

The LEE WILSON ENG. CO.

OFFER THE FLAT ROLLED PRODUCTS INDUSTRY A
COMPLETE ENGINEERING AND EQUIPMENT SERVICE



Products

AUTOMATIC FEEDING AND CATCHING
TABLES
CONTINUOUS PACK AND PAIR HEATING
FURNACES
WHEELABRATOR ABRASIVE CLEANING
EQUIPMENT

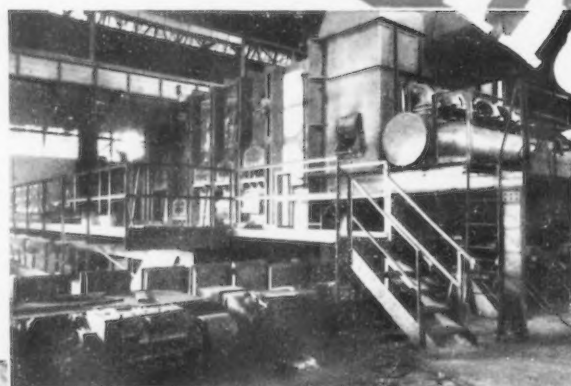
SHEET GALVANIZING EQUIPMENT
AUTOMATIC TINNING EQUIPMENT
AUTOMATIC DOUBLERS
NORMALIZING FURNACES

CONTINUOUS STRIP PICKLING EQUIPMENT including:

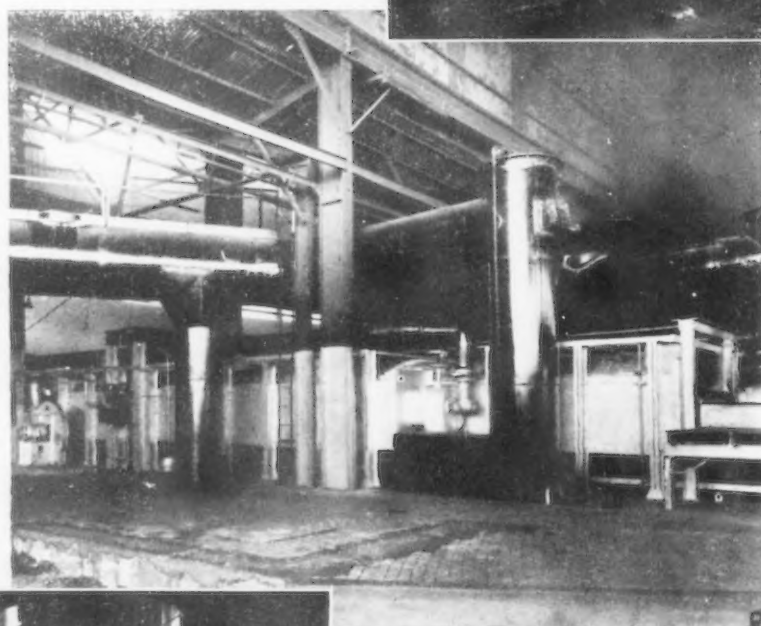
UNCOILERS, UP-CUT SHEARS, STITCHING MACHINES, PINCH
ROLL UNITS, RECOILERS, DRYING MACHINES, PICKLING TANKS,
and AUXILIARY EQUIPMENT * * *

SCRUBBING, LEVELING, and OILING MACHINES for FLAT PRODUCTS

Efficient Heating

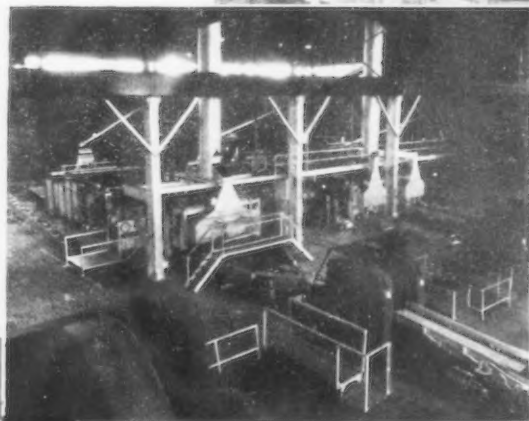


Raw Producer Gas Burner Application to Flinn & Drefflein "Radiant Gap" Continuous Pack Furnace.



Flinn & Drefflein Producer Gas Laboratory Type Continuous Billet Heating Furnaces.

Installation of Oil Fired Continuous Pack and Pair Heating Furnaces in a Modernized Sheet Rolling Plant. Installed by the Wean Engineering Co., Warren, O.



Through more than twenty-five years of successful engineering and development, the Flinn & Drefflein Company, of Chicago, have developed the most efficient heating plants now available in the steel industry *****

Many such plants using Raw Producer Gas, Natural Gas, Coke Oven Gas or Oil are in successful operation in the United States and foreign countries for the heating of slabs, billets, bars, and sheets.

FLINN & DREFFEIN COMPANY

CHICAGO, ILLINOIS.

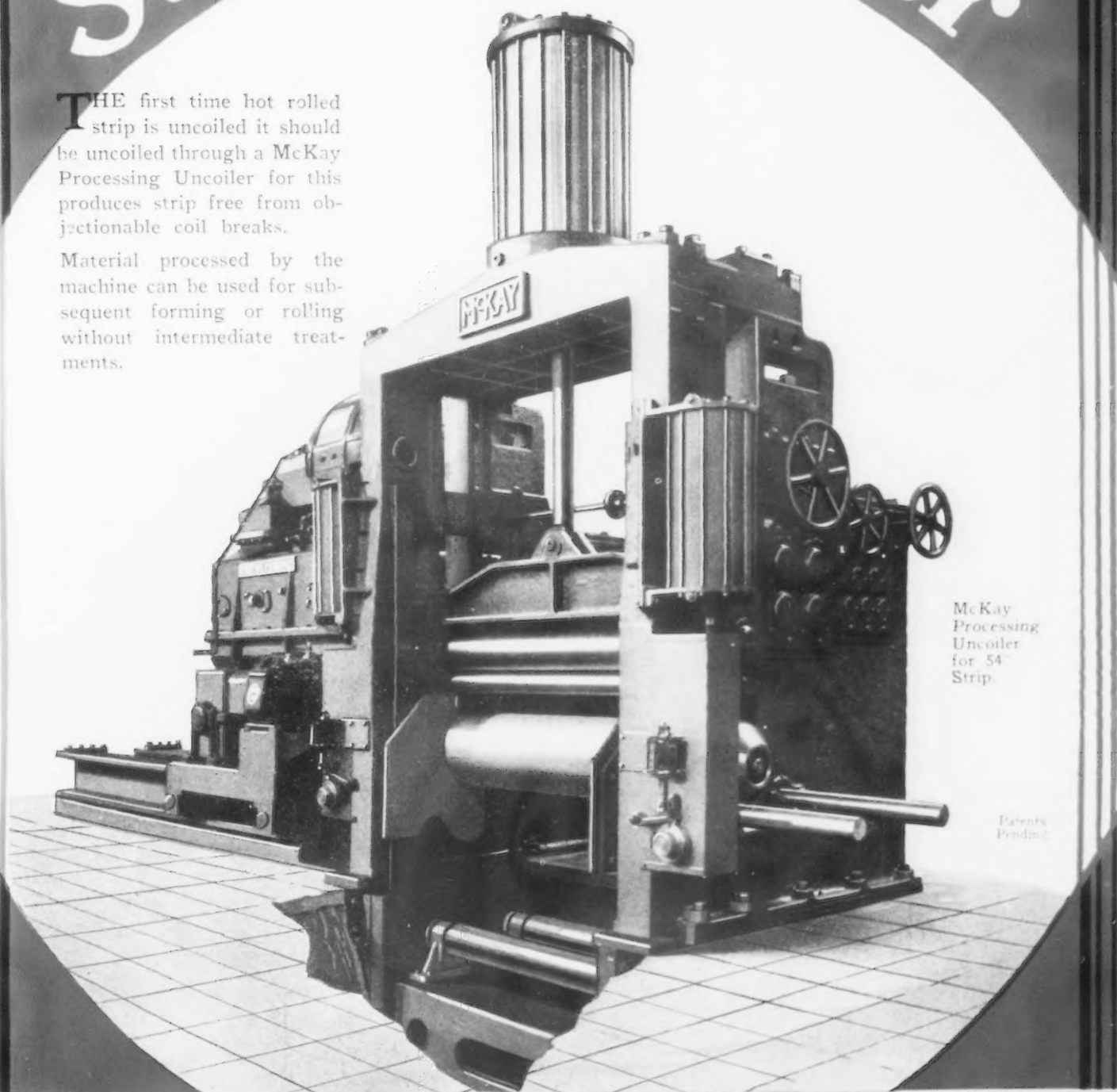
Associate Company.

The **WEAN ENGINEERING CO., Inc.**
Warren, Ohio

Strip Uncoiler

THE first time hot rolled strip is uncoiled it should be uncoiled through a McKay Processing Uncoiler for this produces strip free from objectionable coil breaks.

Material processed by the machine can be used for subsequent forming or rolling without intermediate treatments.



McKay
Processing
Uncoiler
for 54
Strip.

Patents
Pending

THE MCKAY MACHINE COMPANY

ENGINEERS AND MANUFACTURERS OF SHEET, TIN AND STRIP MILL EQUIPMENT
YOUNGSTOWN, OHIO

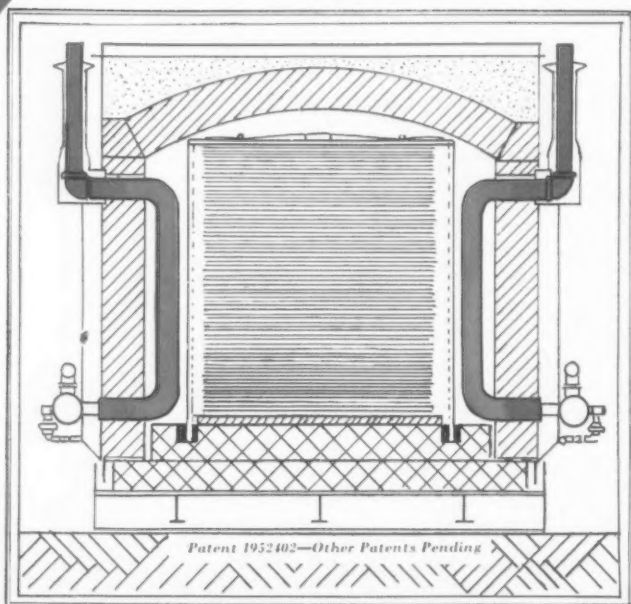
Associate Company.

The WEAN ENGINEERING CO., Inc.

Warren, Ohio

in Annealing Achievement

The Triple "A" System



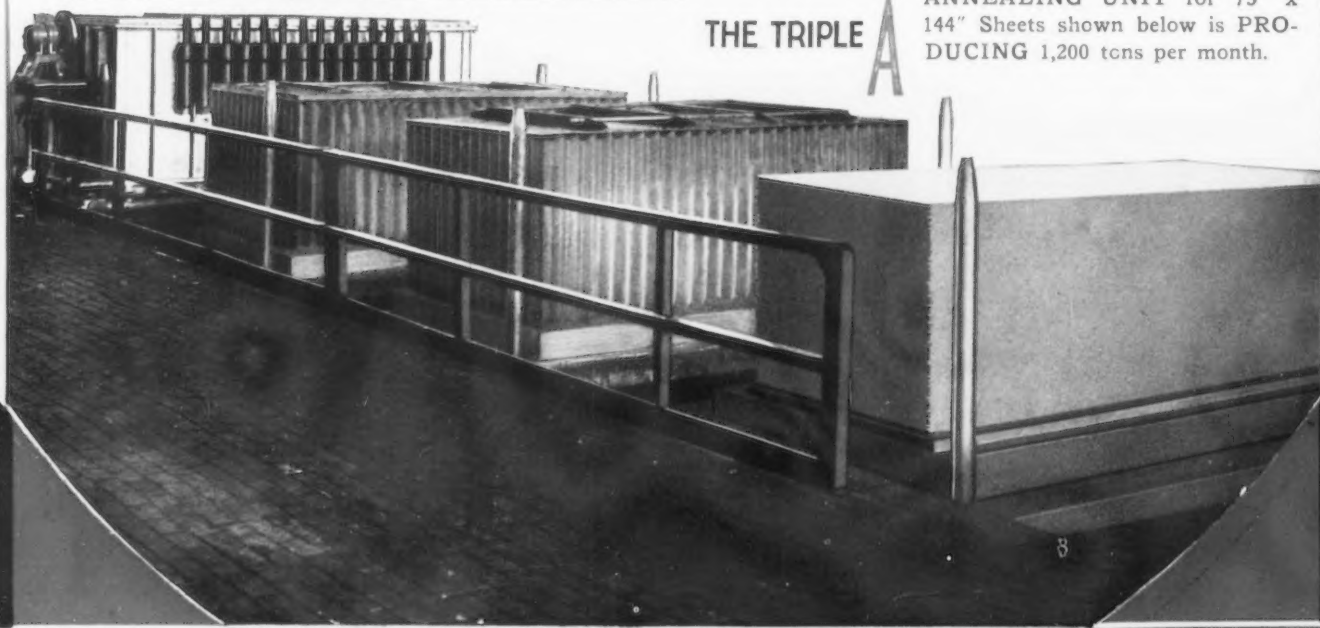
THE Wilson Tube Type Annealing Cover with the special inner cover produces the finest quality of annealed sheets, from the standpoint of physical and surface specifications, at the lowest possible cost.

The purchase of 19 Wilson Annealing Units in the last nine months by leading steel companies is proof of this Annealing Achievement.

THE TRIPLE

A

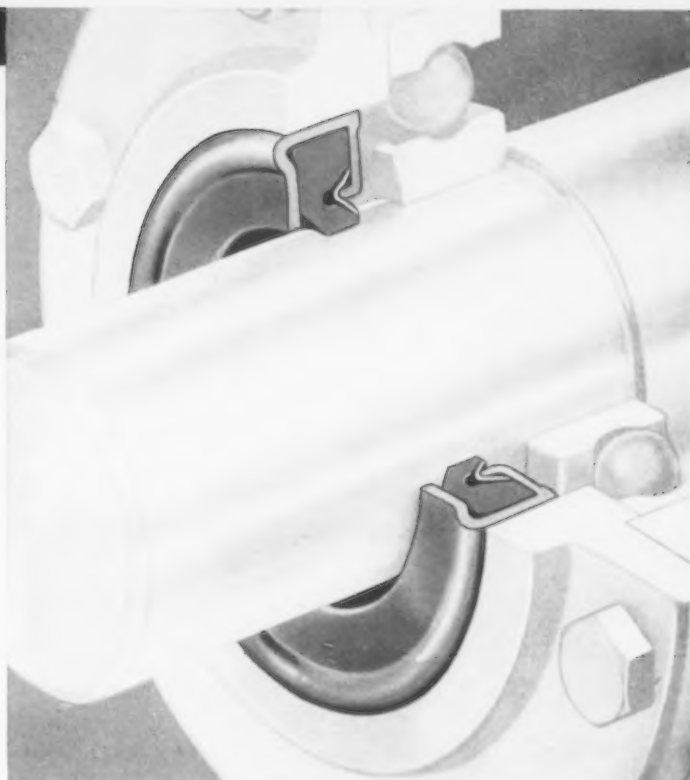
ANNEALING UNIT for 75" x 144" Sheets shown below is PRODUCING 1,200 tons per month.



An Exclusive Development of
LEE WILSON ENGINEERING
 Cleveland, Ohio
 SOLD BY
THE WEAN ENGINEERING CO., INC.,
 WARREN, OHIO

P A T E N T E D

ENGINEERS *all over the country* ASKED FOR A **BETTER** OIL SEAL



Particularly Effective for Sealing ROLL NECKS

The Garlock KLOZURE protects Roll Neck and other bearings in steel mills from sand, grit, mill scale and water and at the same time it retains the grease or oil in the bearing.



They Now Have It—in the New GARLOCK **KLOZURE**

TO retain oil and grease within a bearing and to keep dust and dirt out of the bearing is essentially a *packing* job. That's why Garlock undertook the development of a truly effective Oil Seal. The result of many months of study and experimentation is the Garlock KLOZURE.

The sealing member in the Garlock KLOZURE is not leather, cork or felt. It is made from a special compound, developed in the Garlock laboratories, and molded into a shape resembling the famous Garlock Chevron packing ring.

Because of its uniform performance, its resistance to oil at high or low temperatures and its low co-efficient of friction, the Garlock KLOZURE is setting new high standards for efficient Oil Seal performance. Write for descriptive booklet.



THE GARLOCK PACKING COMPANY
PALMYRA, NEW YORK

In Canada: The Garlock Packing Company of
Canada, Limited, Montreal, Quebec

G A R L O C K

An Allis-Chalmers Motor for Every Drive

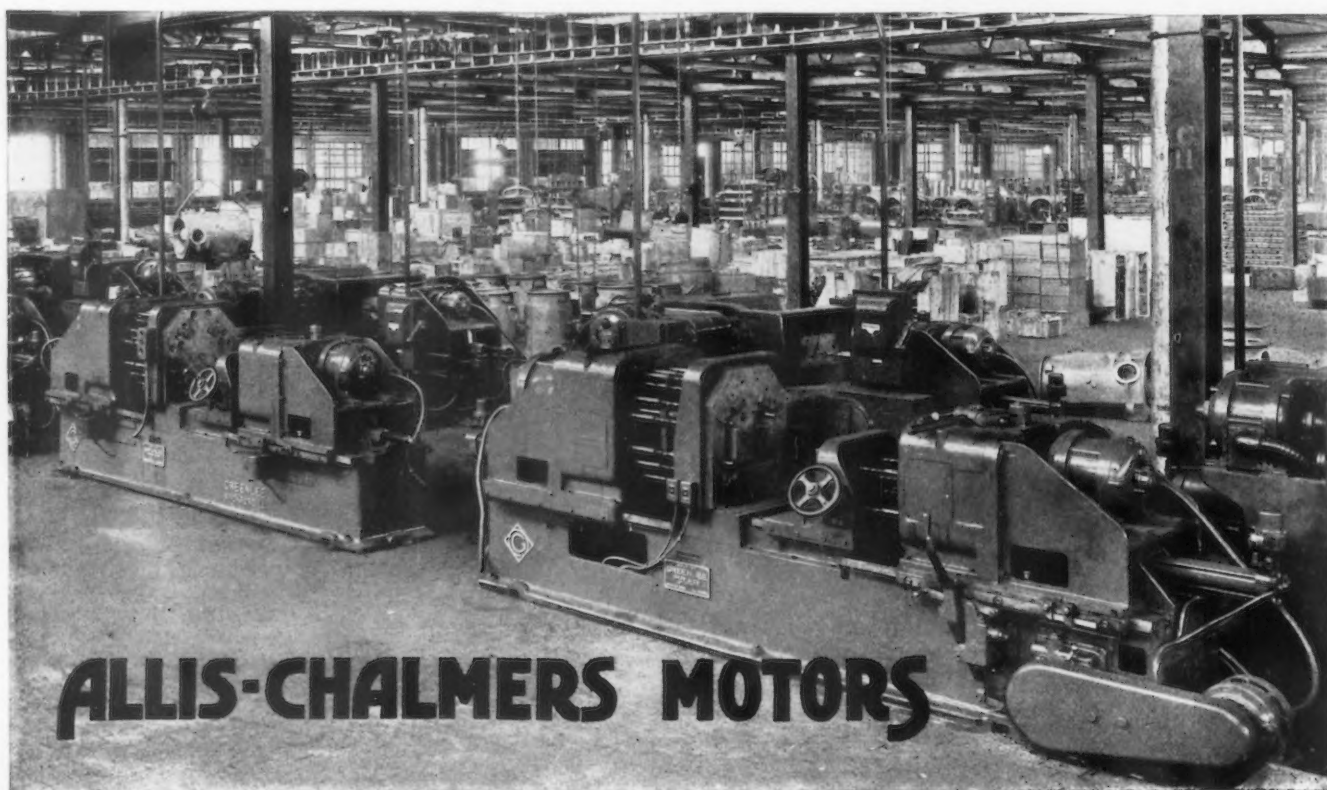
THE exacting requirements of drives in metal-working plants are fully met by Allis-Chalmers Motors.

They are available for any type of mounting—horizontal or vertical; flange type, direct connected; also as gearmotors for slow speed drives.

These motors can be furnished with electrical characteristics to meet the requirements of special, as well as standard, applications.

Allis-Chalmers district offices in all principal cities and many foreign countries are prepared to assist in problems of motor application for standard or special drives.

ALLIS-CHALMERS MANUFACTURING CO.
MILWAUKEE, WISCONSIN



REDUCING POWER COSTS CAN CHANGE A STATEMENT FROM RED TO BLACK



INDIVIDUAL MOTOR DRIVE

COST OF 4 7½ H.P. MOTORS		COST OF 4 SWITCHES, CONTROLS, WIRING ETC.	
COST OF 4 7½ H.P. DRIVES INC. LABOR			

\$492. \$170. \$494.

INVESTMENT COST
PER MACHINE \$289.00

MODERN GROUP DRIVE

COST OF LINE SHAFT, STRINGERS, HANGERS, PULLEYS, BELTS—INC. LABOR		
COST OF ONE 20 H.P. MOTOR		COST OF CONTROLLER, WIRING ETC.

\$215. \$230. \$219.

INVESTMENT COST
PER MACHINE \$166.00

MOST PLANTS can save money by preventing power waste, which is hidden somewhere in the total cost of power delivered to the production machines—enough money in many plants to change a deficit into a profit or to double existing profits.

There are two widely accepted methods of power transmission: *Unit Drive* (individual smaller motors) and *Modern Group Drive* (one larger motor for a group of machines). As an executive you do not need a study of your plant by an expert to appreciate the facts graphically illustrated at the left. Nor to see how related production machines can be grouped into a

number of manufacturing units operated by larger and more efficient motors, at the same time maintaining harmony with production requirements.

Since certain departments in most plants permit of such grouping of machines, the possibilities of reduction in real power cost (frequently more than double the power bill) are too important to ignore. The facts have already been established through case studies in specific plants. These are available upon request.

Our Red Book, free on request, tells the whole story in graphic non-technical terms. Why not send for it today?

POWER TRANSMISSION COUNCIL

(SPONSORED BY MECHANICAL POWER ENGINEERING ASSOCIATES)

An association of producers and distributors of power, power units and mechanical equipment for the transmission of power.

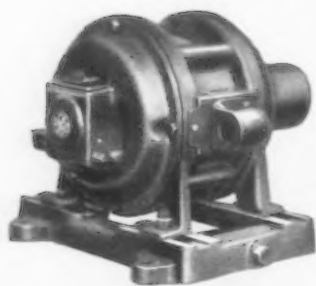
370 LEXINGTON AVENUE, NEW YORK

This advertisement also appears in *Business Week* and 8 other publications.

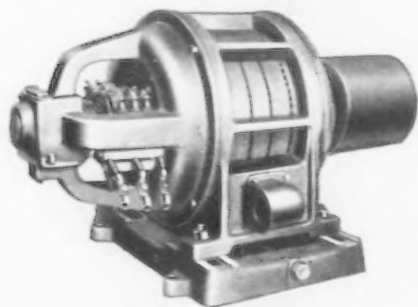


A POWER DOLLAR SAVED IS A PROFIT DOLLAR EARNED

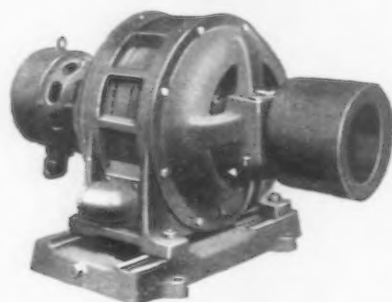
Which MOTOR



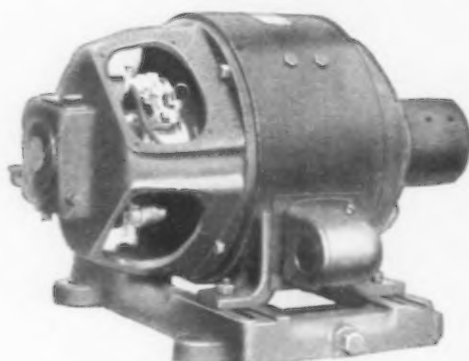
Squirrel-cage induction



Wound-rotor induction



Synchronous



Direct-current

FOR RUN-OF-THE-PLANT JOBS—THE G-E SQUIRREL-CAGE INDUCTION MOTOR. A simple, sturdy motor with an indestructible cast-aluminum rotor. It is thoroughly dependable, and will give you years of reliable service. It's easy to select the G-E induction motor with the right torque, starting current, horsepower, slip, and speed characteristics for your job, because you can choose from a wide variety of types and thousands of different sizes and ratings.

•

FOR YOUR ADJUSTABLE-VARYING-SPEED OR HIGH-STARTING-TORQUE LOADS—THE G-E WOUND-ROTOR INDUCTION MOTOR. It's the right drive for jobs like these: large ventilating fans where you want speed control; crushers, kilns, cranes, hoists where you need high-starting torque. With the right G-E control, this motor will give you a range of speeds down to one-half synchronous speed.

•

FOR YOUR CONSTANT-SPEED LOADS WHERE YOU WANT HIGH EFFICIENCY AND POWER-FACTOR IMPROVEMENT—THE G-E SYNCHRONOUS MOTOR. In many plants these economical drives have paid for themselves many times over by reducing power costs through power-factor improvement. As a drive for your low-speed machines, such as large compressors, ball mills, Jordans, etc., you can't find a better alternating-current motor.

•

WHERE YOUR POWER IS DIRECT CURRENT—THE G-E DIRECT-CURRENT MOTOR. Also use this motor wherever your load requires fine speed control. With many different types, sizes, and ratings to choose from, it is an easy matter to select the G-E direct-current motor with the right torque, horsepower, and speed characteristics to meet the requirements of your job.

G E N E R A L

for YOUR JOB?



Splash-proof motor for jobs where there are splashing or falling liquids

**THE RIGHT MOTOR
FOR EVERY JOB—
THE RIGHT CONTROL
FOR EVERY MOTOR**



Totally enclosed, fan-cooled motor for jobs in dusty, dirty places



Standard open motor for run-of-the-plant jobs



Explosion-proof motor for jobs in hazardous gas locations defined as Class 1, Group D

Whatever type of motor your job requires, you can just about name your operating conditions, and we'll supply your motor with the proper enclosures. For example, take the open squirrel-cage induction motor in the center of this red circle. This is the RIGHT motor for jobs under normal operating conditions. When it is to be operated in dusty, dirty places, it is totally enclosed. When it is to be operated where there are splashing or dripping liquids, it is protected with splash-proof coverings. Likewise, there are explosion-proof, vertical, and flange-mounted motors, gear-motors, and many other kinds that General Electric offers you to make sure that you get the full value from your investment. Address the nearest G-E sales office, G-E Motor Dealer, or General Electric, Dept. 6D-201, Schenectady, N. Y.



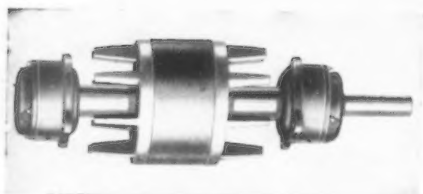
Gear-motor for low-speed jobs



020-101

E L E C T R I C

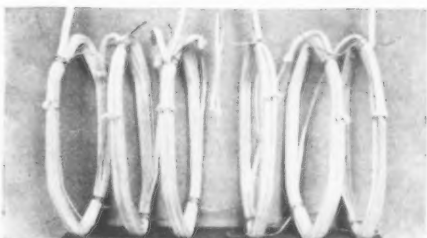
BOTH GUARD



Complete rotor assembly with cartridge-type sealed ball bearings. Note the one-piece rotor winding.



Ball bearings need only yearly lubrication with tube-contained lubricant. Dust-tight bearings. No lubrication drip.



Coils are group wound. An entire phase group is a single piece of wire—lead connections from each group are welded—not soldered or brazed.



Leads are sealed in through frame opening—and anchored permanently. No chance for strain on field leads.

Motors built to the world's most exacting standards

Setting new and higher standards in motor construction and performance is a responsibility Fairbanks-Morse takes seriously.

Fairbanks-Morse was the *first* to pioneer ball bearing motors . . . one-piece rotor construction . . . grease tube lubrication and a host of other improvements — all major contributions to the art of building motors. Mechanical excellence *plus* electrical performance *plus* sound engineering—that's the Fairbanks-Morse standard to which its motors are built.

We invite you to investigate for yourself the *extra* features built into F-M Motors. Address Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Illinois. 32 Branches at Your Service Throughout the United States.



Self-locking slot insulation—permanent and additional protection for field windings.



Final vibrometer test. One of a series to insure a smooth-running motor with minimum vibration.

Pioneer
Designers
and
Manufacturers
of
POWER, PUMPING AND WEIGHING EQUIPMENT
104 Years



FAIRBANKS

MOTORS AND

THE *profits!*

Scales that set the world's accuracy and dependability standards

Perhaps you have never considered the raw materials and finished production goods moving through your plant as so much cold cash.

Is an inaccurate scale or careless operator causing you a steady loss on "short" or "long" weight? However accurate your scale mechanism may be, it cannot compensate for human error.

Fairbanks pioneering in scales now brings you an accurate *printed* check on every scale operation. An ingenious device automatically prints a ticket showing not only the weight, but any other pre-set information pertaining to the operation, such as date, etc.

Inquire about this important new scale development. In some spot in *your* plant it may quickly save you heavy losses through overweight, underweight and in material handling. For full information write Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. And 40 principal cities — a service station at each house.

This printing mechanism automatically delivers a printed weight ticket containing both the weight and any other desired pre-set information relating to the operation performed.



-MORSE

SCALES

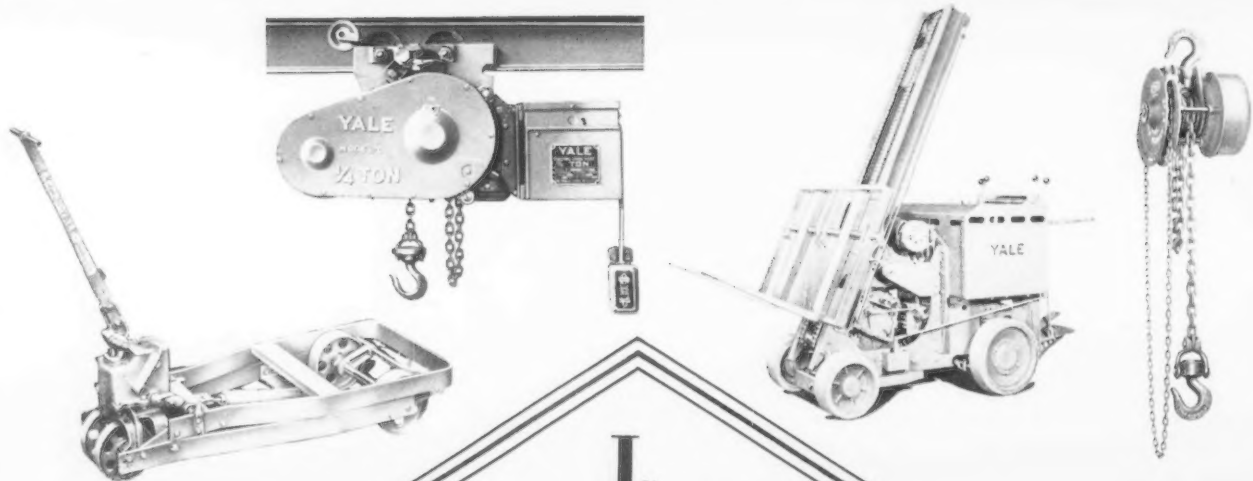
PREFERRED THE WORLD OVER



6228-E SA 40.14

THE IRON AGE, January 3, 1935—369

YALE . . The Name to Remember—When the Plant Problem is—HAULING or LIFTING!



I_N these days of industrial modernization all executives realize the importance of minutes saved. Time lost is money lost—and it cannot be recovered.

Too frequently, modernization while stressing these factors that make for finer quality, greater production and better plant arrangement, overlooks that vitally important element in efficiency—materials handling. Machines remain idle because raw materials are held up by inadequate lifting and hauling equipment.

Yale Hand or Electric Hoists, combined with Yale Trolleys—or Yale Hand Lift and Electric Trucks with Yale Steel-Bound Skid Platforms—will facilitate interplant handling operations and save time in getting materials into position for machines to fabricate. They will also simplify the storing of raw or finished products.

THE YALE & TOWNE MFG. CO.

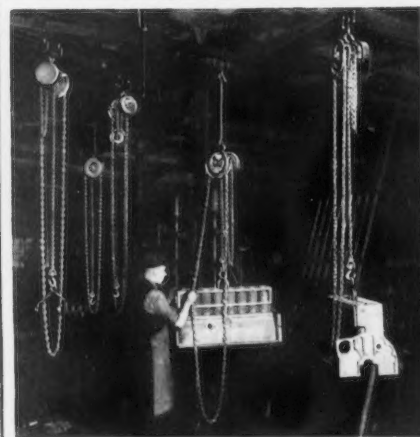
Philadelphia Division

PHILADELPHIA, PENNA. U. S. A.

TRADE MARK **YALE** MARK



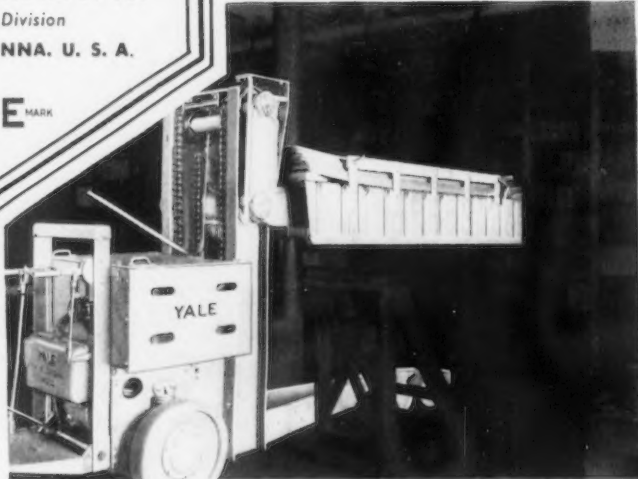
Yale Electric Hoist Speeds up handling operation and effects economies in Machine Tool Plant.



Yale Spur Geared Hoists handling cylinder blocks at the Spindle Boring Machine in Automobile Plant.



Yale Hand Lift Truck and Platforms, in service in Wire Product Plant eliminates many handling operations.



Yale High Lift Electric Truck on duty in stock room of Steel Warehouse, cutting the handling operations to a minimum.

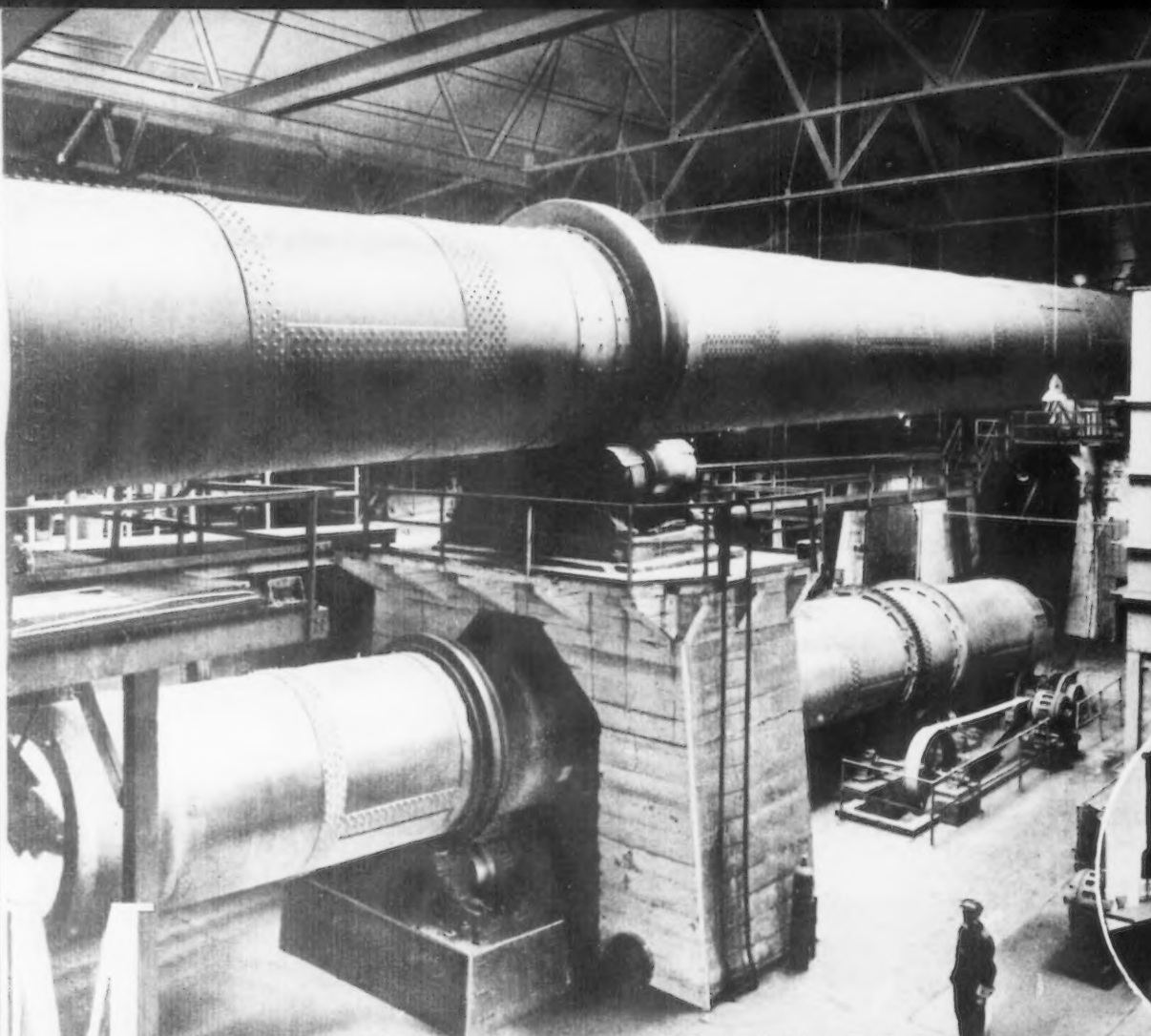
1935



More than a SYMBOL

THE new articulated streamline train is more than a unique symbol of progress. It will undoubtedly make a practical contribution to the earning power of our rail systems. It will shorten distance, revise time schedules downward, lower costs of operation, improve transportation . . . In a parallel manner, the mission of Magnefer is to reduce the time consumed in the repair of open hearth furnaces, to lower the cost of their maintenance and to promote the quality of the finished steel.





RESEARCH
•
QUARRYING
CRUSHING
SIZING
•
FLUXING
FUSING
COOLING
•
TAR-SEALING



MAGNEFER PATENTED has a STAKE in Tomorrow's WORLD OF STEEL

Basic Dolomite Incorporated is also a producer of open hearth raw dolomite, blast furnace flux, crushed stone, agricultural limestone, and railroad ballast.

BASIC DOLOMITE INCORPORATED, largest producer of dolomite refractories, acknowledges a responsibility to the steel industry. It is reflected in the company's resources and operations . . . An inexhaustible deposit of pure dolomite—modern facilities for milling the raw rock at the rate of 300 tons per hour in accordance with the most approved engineering standards—clinkering plants with a daily capacity of 800 tons of infused

clinkered dolomite. A Research Department working continuously to improve basic refractories, to the end that they may be used more generally in open hearth practice and that the practice itself may be improved. All integrated closely and completely on the same site. A background of twenty years' experience and reliable service . . . These factors mark out a source of supply in which refiners of steel may put entire confidence.

BASIC DOLOMITE INCORPORATED • HANNA BUILDING, CLEVELAND



MAGNEFER SETS FAST • STAYS FAST

Alliance

"LARGEST BUILDERS OF THE WORLD'S LARGEST CRANES"

Alliance Products
STANDARD CRANES
Up to 500 tons capacity
STRIPPING CRANES
Up to 400 tons capacity
COMBINATION CHARGERS
and **STRIPPERS**
Up to 200 tons capacity

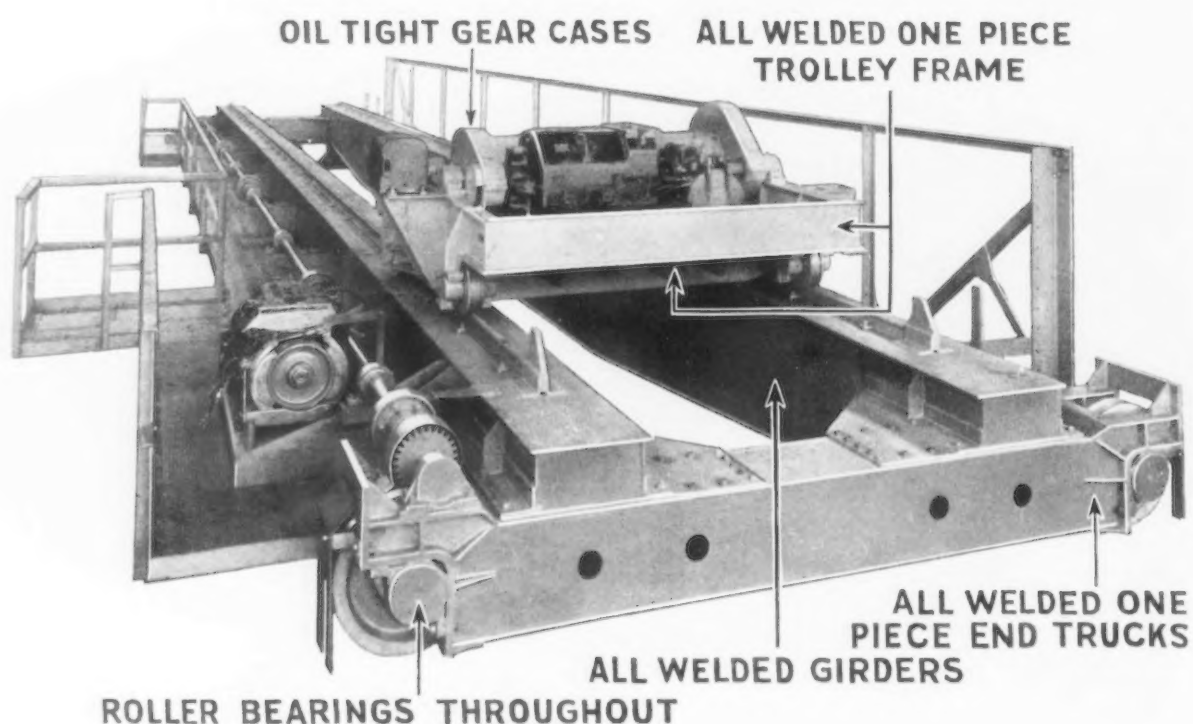
Ladle Cranes — Ingot Strippers
Soaking Pit Cranes
Open Hearth Charging Machines
Slab and Billet Charging and Drawing Machines
Gantry Cranes—Ore and Coal Bridges
Car Dumpers—Forging Manipulators
Board Drop Hammers
Steam Drop Forge Hammers
Coke Pushers, Levelers and Door Lifters
Coal Pier Equipment
Rolling Mill Machinery
Cement Plant Machinery
Dock Handling Equipment
Coke Oven Equipment

ALLIANCE MACHINE CO.
Alliance, Ohio

150-Ton Combination Stripper and Extractor
Handling Big-end-up and Little-end-up Ingots

Builders of Steel Mill Cranes of Steel Mill Steel

A HEAVY DUTY STEEL MILL CRANE



5200 Cranes have been built by Cleveland in 35 years. This well fits us
to meet your most exacting modernizing requirements.
Custom built or standard equipment.

THE CLEVELAND CRANE & ENGINEERING CO.

NEW YORK

DETROIT

Wickliffe, Ohio.

PITTSBURG

CHICAGO

CLEVELAND



CRANES

Builders of Cleveland Tramrail Systems

CLEVELAND TRAMRAIL • CLEVELAND TRAMRAIL

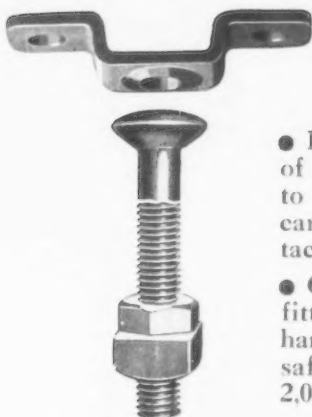
is designed around time proven engineering studies. Below are shown some of the high spots.

has helped many reduce cost, increase production, reduce idle machine time, and that last hour man power fatigue. Why not you?



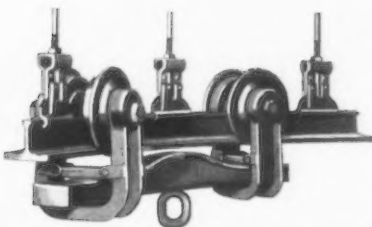
ONE piece rail rolled specially and used exclusively as the track for Cleveland Tramrail systems, having a raised tread or wearing strip which prevents peining or bending down of the rail flange.

• This same rail is used in making Cleveland Tramrail Arch Beam rail, which is formed by electrically welding the rail to a wide flanged tee section. The same rail and fittings are used for both hand and electrically operated systems.



• Flexible ball and socket method of supporting rail permits the load to swing with the motion of the carrier—keeping all wheels in contact with the rail continuously.

• Cleveland Tramrail suspension fittings, i. e., rail clamps, couplings, hanger rods, ceiling fittings, have a safety factor of five (5) or more at 2,000 pounds working load.

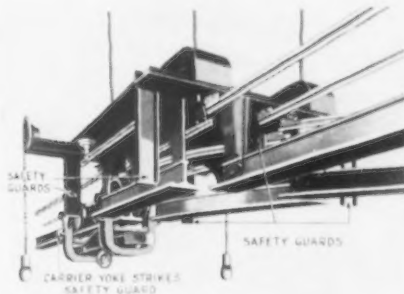


• Hand Propelled Carriers have a guaranteed starting effort of 15 pounds—10 pounds running effort, per ton load. Chilled Tread Wheels, factory lubricated for life, sealed against dust and dirt.

Swivel yokes of rolled steel-welded.
Two point king pin support.
Load bar pressed steel-welded.
Forged steel eye bolt with hardened steel seat under forged head.



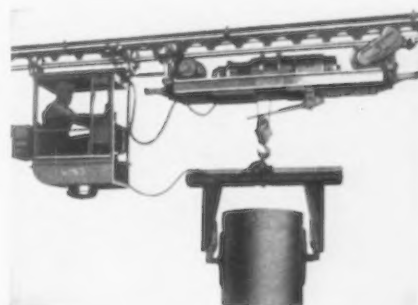
Consult your Telephone Directory under Cleveland Tramrail.



Switches (five types) easily operated, fool proof and with safety features which are safe.



Underslung hand or motor operated cranes and transfer bridges, non-binding, regardless of the position of the load on the bridge. Transfer Bridge interlock and discharge point positively lock the bridge into position. Safety forks prevent carrier running off bridge or open end of rail.

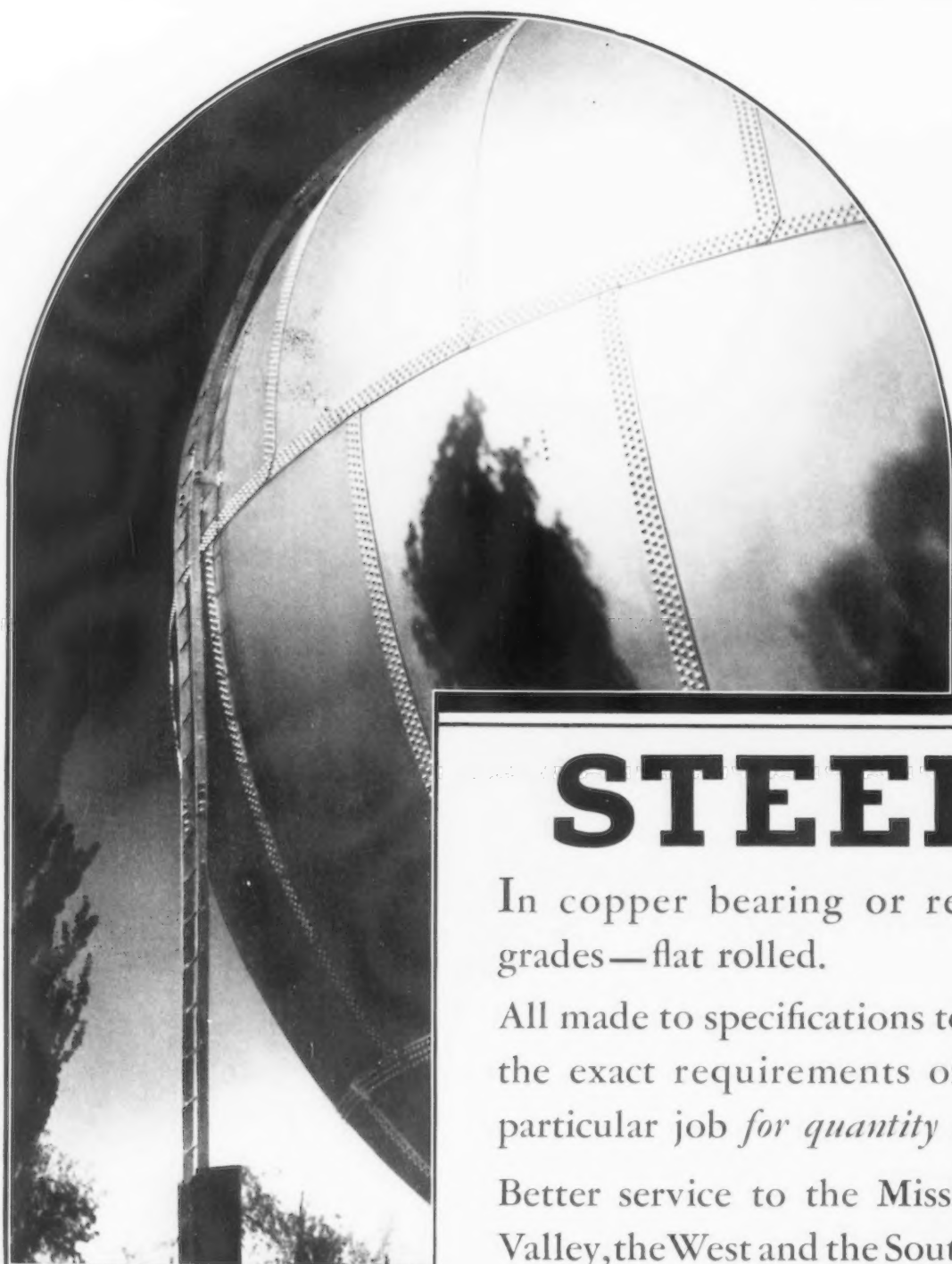


Motor operated carriers retain the principle of long wheel base—swivel yokes and ball bearing wheels, also king pin or other method of suspending the load bar so as to permit banking of the carrier when traveling around curves, and at all times maintaining equal load on all wheels.

CLEVELAND



TRAMRAIL



STEEL

In copper bearing or regular grades—flat rolled.

All made to specifications to meet the exact requirements of your particular job *for quantity orders.*

Better service to the Mississippi Valley, the West and the Southwest—thru 28 railroads and the Mississippi River serving this mill.

GALVANIZED SHEETS
STEEL SHEETS
PLATES AND
TIN PLATE



GRANITE CITY STEEL CO

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5719 Ellsworth Ave., Dallas
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1613 Pioneer Building, St. Paul.
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BUILT BY **E** MORGAN *Engineering* » »



MORGAN PRODUCTS » »

ELECTRIC TRAVELING CRANES
PLATE MILLS • BLOOMING MILLS
INGOT STRIPPING MACHINES
CONTINUOUS MILLS • STRUCTURAL MILLS
CHARGING MACHINES • LADLE CRANES
STEAM HYDRAULIC FORGING PRESSES
SOAKING PIT CRANES • STEAM HAMMERS
SPECIAL MACHINERY FOR STEEL MILLS

**DESIGNERS
MANUFACTURERS
CONTRACTORS**

Pioneer
builder of heavy duty
steel mill cranes, Morgan
Engineering inevitably builds into
any crane for any purpose all the ad-
vantages of the most advanced engineering
principles along with traditional Morgan
soundness. This 10-ton, double hook, Morgan
mill type crane for handling pipe in a mill ware-
house is as well built and carefully engineered
as a hot metal crane. Of all elements entering
into construction of anything Morgan builds,
Morgan integrity is the most valuable
ingredient of all.

THE MORGAN ENGINEERING CO.
ALLIANCE, OHIO

Pittsburgh, 1420 Oliver Bldg.
New York, 11 W. 42nd St.

AN *Improved* **WRIGHT HOIST**



21 POINTS OF SUPERIORITY

*In all capacities
300 Pounds to 40 Tons*

Master engineering—scientific design—finest materials—backed by long years of experience have gone into the development of the new, improved Wright High-Speed Chain Hoist.

In the new Wright Hoist there are 21 points on which it is superior to all former models. Summarized, those 21 points mean:

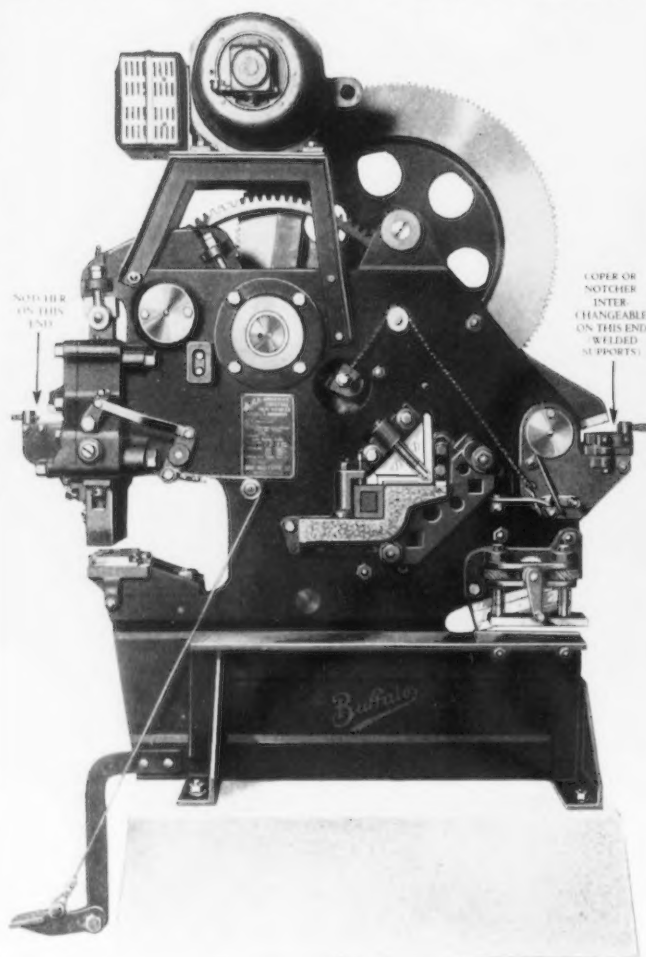
- 1—GREATER EFFICIENCY
- 2—LONGER LIFE
- 3—INCREASED USEFULNESS

Send for an illustrated catalog showing a cut-away view of the new Wright Hoist. See for yourself why the 1934 Improved Wright is sturdier, more efficient and positively rust-proof.

Remember—no advance in price.



Large or Small— your shop can save money with this Iron Worker



If you cut and punch sheets, angles, tees, rounds, squares, flats or other structural shapes—to make bases, bridges, battleships or brackets—your shop can **CUT COSTS** with a Universal Iron Worker! We know from the experience of hundreds of users, that every Iron Worker more than pays for itself where cutting and punching is done daily.

Send for Bulletin 322

Get all the facts about this husky machine with the electrically-welded "ARMOR-PLATE" Frame, guaranteed unbreakable **FOREVER!** Four sizes, to fit your requirements.

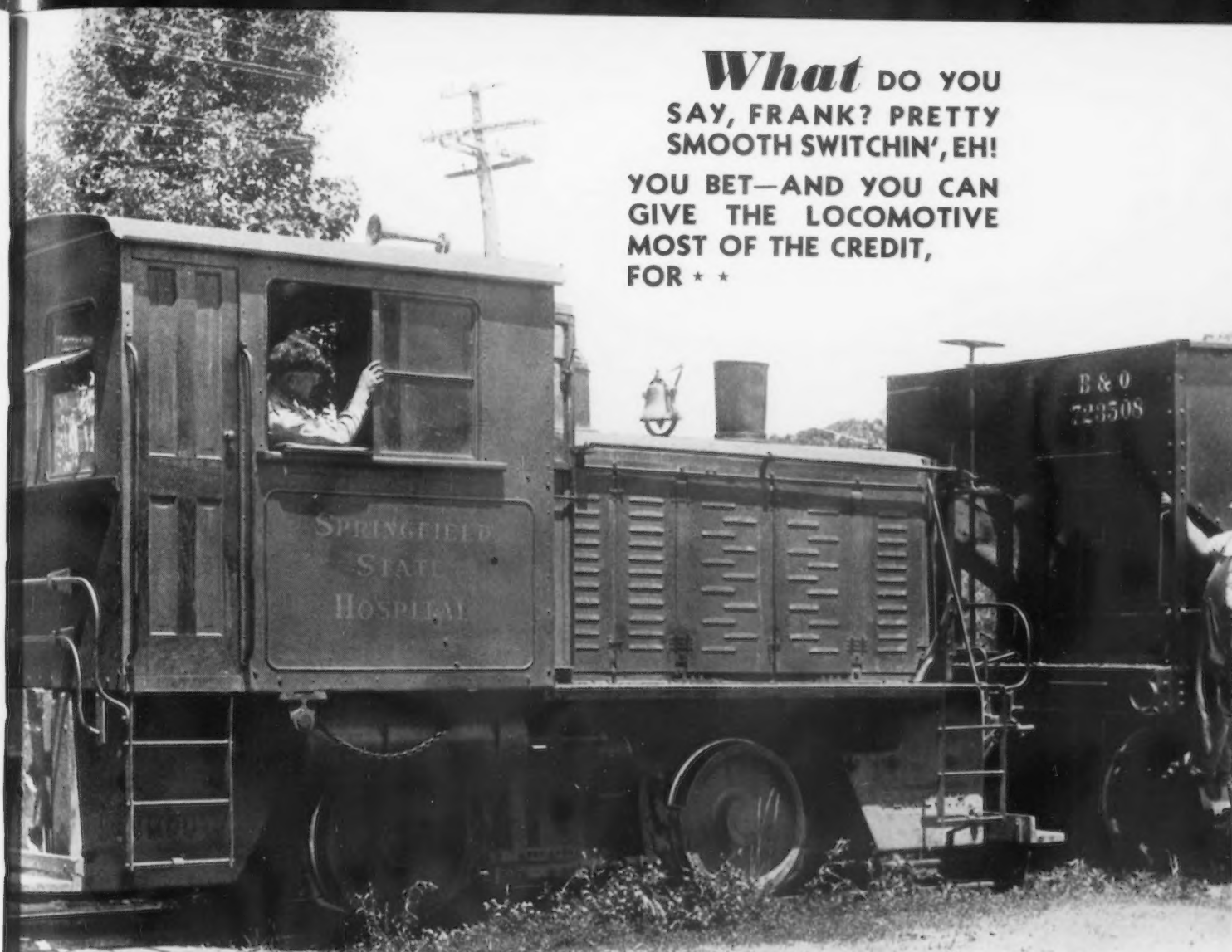
BUFFALO FORGE COMPANY

492 Broadway, Buffalo, N. Y.

In Canada: Canadian Blower & Forge Co., Ltd.,
Kitchener, Ont.

"Buffalo" **ARMOR-PLATE
UNIVERSAL
IRON WORKERS**

What DO YOU
SAY, FRANK? PRETTY
SMOOTH SWITCHIN', EH!
YOU BET—AND YOU CAN
GIVE THE LOCOMOTIVE
MOST OF THE CREDIT,
FOR * *



★ It's a PLYMOUTH

Last year, this 35-ton PLYMOUTH GASOLINE LOCOMOTIVE, owned by Springfield State Hospital, Sykesville, Md., switched and hauled 348 carloads of coal and supplies over a 2½-mile private road without a sign of delay. Talk about saving money, say—when a Plymouth Locomotive replaced a steamer, as this one did, you can't help saving money. You save the cost of firing . . . and labor . . . and all the money it takes to keep the old locomotive in running condition. Remember—you can do better work with a gasoline locomotive if IT'S A PLYMOUTH.



★ *Bulletin ML contains a complete description of the Plymouth Locomotive illustrated above. Mechanical details and specifications are also included. Send for your FREE COPY today. No obligation whatever.*

PLYMOUTH LOCOMOTIVE WORKS, PLYMOUTH, OHIO, U. S. A

Stand By! If You Want

Jeffrey Service for the Foundry is the Most Complete to be Had . . .

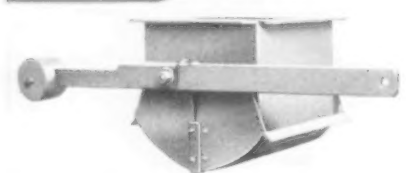
Our Foundry Engineers have had Years of Experience . . . they know Your Requirements . . . They Build for You



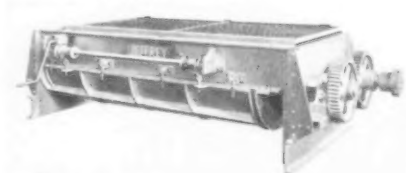
Belt Conveyors



Leak-Proof Apron Conveyors



Foundry Type Valves



Sand Mixers



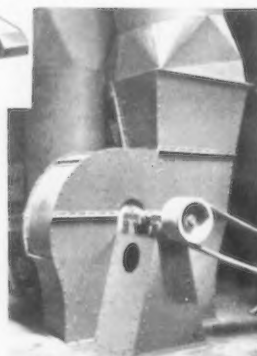
Aerators



Portable Conveyors



Pulverizers



Fans

Foremost among the advantages which Jeffrey Foundry Equipment offers is the sound engineering foundation on which the design of its units and systems is based . . . the result of more than half-a-century's experience.

Experience of this kind is the manufacturer's greatest asset . . . the purchaser's best assurance of getting the right equipment for the right job.

Jeffrey service to the Foundry is most complete. It includes: Sand Handling, Reclaiming, Mixing, Preparing, Conditioning and Distributing Systems, complete with the necessary accessory Ventilation and Dust Arresting Equipment; Flask-filling Equipment; Mold, Casting, Flask, Coke, Pig Iron, Scrap and Limestone Handling Equipment; Conveyors for continuous sand-blasting and core-drying; also Reduction Machinery for cores and other foundry materials.

This broad service not only covers the design and manufacture of these equipments, but their complete installation as well. Various types of Jeffrey Foundry Equipment are illustrated on these two pages.

Let Jeffrey Foundry Engineers, with their extensive experience in serving the requirements of your Industry, help you put your plant on a more efficient and cost-saving basis. They can render you an invaluable service.

The Jeffrey Manufacturing Company

925-99 North Fourth Street, Columbus, Ohio

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Philadelphia
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Detroit
Milwaukee

Denver
Cincinnati
Huntington

Salt Lake City
Birmingham
Pittsburgh

Rochester
Dallas

JEFFREY MANUFACTURING COMPANY, Ltd., of CANADA

HEAD OFFICE and WORKS: MONTREAL

Branch Offices: Toronto—Calgary—Vancouver



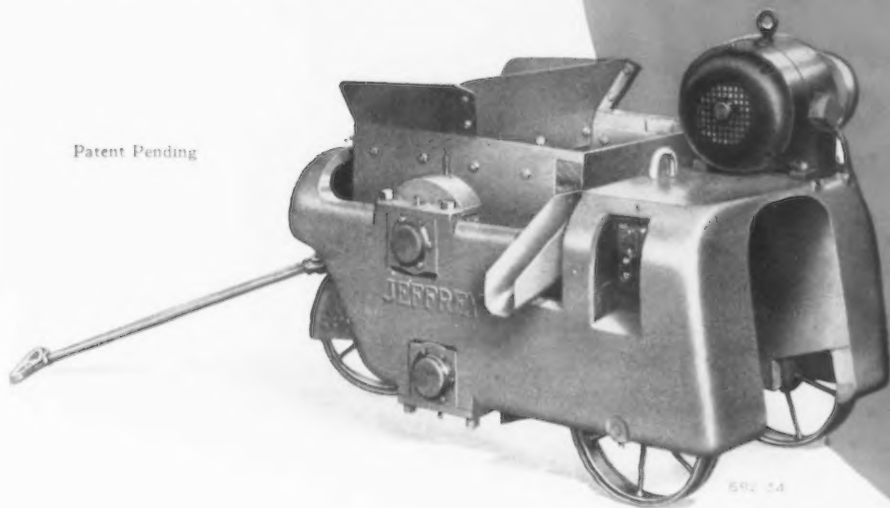
Floor Type Mold Conveyors



JEFFREY

To Reduce Foundry Costs . . .

Patent Pending



New Portable Sand Conditioner Recently developed by Jeffrey . . .

Supplying a long felt need in the foundry industry for an inexpensive, rugged and efficient small portable unit that will positively condition molding sand at low cost and with practically no maintenance, this New Jeffrey Sand Conditioner . . .

1. Thoroughly screens the sand, continuously separating from it refuse such as nails, rods, gagers, bits of core, pieces of metal, etc.; and deposits them in a pile at the side of the machine.
2. Breaks up lumps, due to the highly positive vibration of the screen.
3. Thoroughly cools, blends and aerates the sand, through the Jeffrey principle of aeration.
4. Does not destroy the bond by any raking or scraping action.
5. Throws the sand into fluffy windrows or piles in perfect condition and ready for re-use.

There are no gears, chain, studded belts, rollers or other expensive wearing elements. One V-belt from motor drives the whole machine. Capacity, 10 to 15 tons per hour. Weight . . . approximately 1100 lbs.



Pendant Type Mold Conveyors



Scraper Conveyors



Disintegrators



Flask Fillers



Screens

Portable
Flask
Fillers

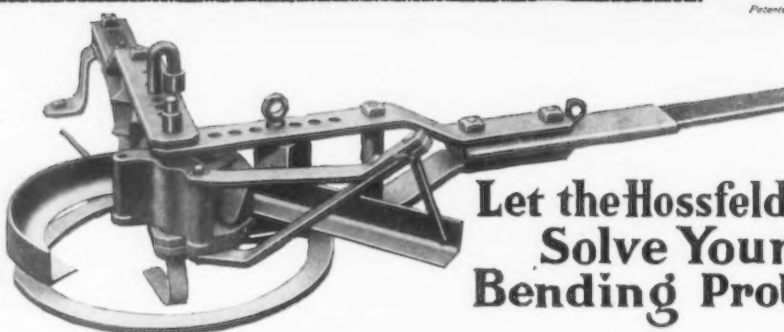


FOUNDRY EQUIPMENT

The HOSSFELD UNIVERSAL IRON BENDER "WRENCHLESS TYPE"

Patented in the U.S. and Canada

**Bends Pipe,
Bars and
Angle Iron**



**Let the Hossfeld Bender
Solve Your
Bending Problems**

No other Bender on the market like it.

This Powerful, Steel Constructed, Wrenchless, Universal, Pipe, Bar and Angle Iron Bender, will neatly, quickly and accurately turn out most any kind of a bending job that ever comes up, either in maintenance or production work — such as Eye Bolts, "U" shapes, "S" shapes, Links, Circles, Offsets, Braces, Cranks, etc. It will also roll eyes on flat stock for Automobile Springs and the like.

It does a perfect job on Pipe work, bending to any degree or to a continuous coil without flattening it or splitting the seam.

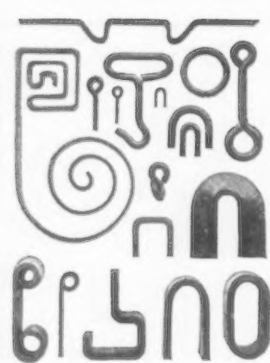
The bending of Angle Iron is an exceptionally wonderful feature of the machine. It forms a smooth perfect curve or circle of any radius desired, without twisting or distorting the stock in the least. It also bends Sharp Square bends on notched Angle Iron.

The machine is built in two sizes. The larger size bending up to 2-inch standard pipe, 4 1/2-inch flat bar stock, or 2x2x3/8-inch angle iron, cold. There are thousands of these machines in use by all classes of trade in the U. S., Canada and other foreign countries.

Write for descriptive literature and prices.

MANUFACTURED ONLY BY

Hossfeld Manufacturing Co.
WINONA, MINN.



Samples of Bar Bending



Samples of Pipe Bending

ATTRACTIVE FINISH HELPS SALES!

The idea of making metal products attractive in appearance seemed like a fad to many manufacturers when first introduced, but today it is recognized as a powerful and indispensable sales aid.

Buyers of metal products—whether they be industrial buyers or the public at large—are looking for attractive appearance as well as for mechanical excellence. Why not give them what they are looking for, and thus remove considerable sales resistance?

This you can do by using Ault & Wiborg enamels and lacquers for finishing your products. As specialists in fine industrial finishes, we can offer you attractive appearance for any type of metal product you manufacture, whether it be refrigerators, metal furniture, cabinets, washing machines, office machines, industrial machinery or whatnot.

Ault & Wiborg will gladly work with you to produce the most durable and attractive finish for your product. May we help you?



AULT & WIBORG CORP.

75 VARICK ST., NEW YORK, N. Y.

Dana Ave.—Cincinnati, Ohio

Branches in the Principal Cities

Look to the INGOT

for Quality in Steel . . .

THE type of ingot as well as class of steel should be a fundamental part of the buyer's specification; as finished product can be no sounder or more reliable than the ingot from which it is produced.

The Three Fundamental Types of Ingot Solidification

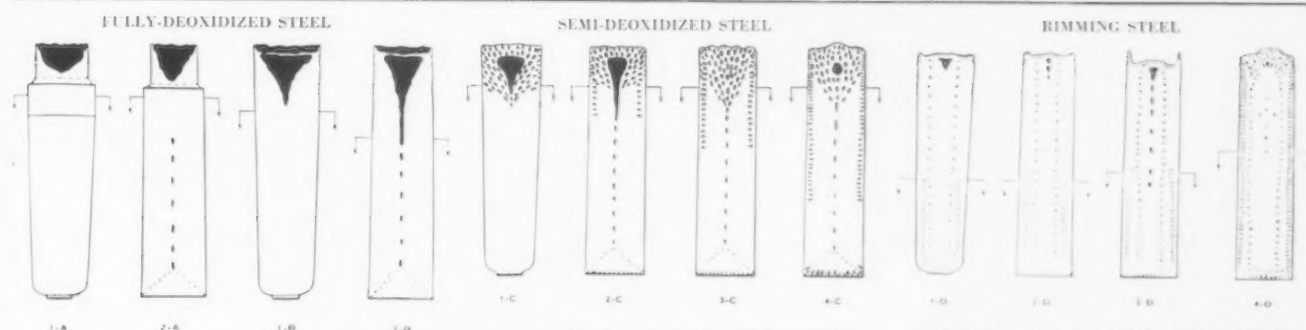


Chart showing sections and average yields of ingots made from fully-deoxidized steel cast in big-end-up and big-end-down mold contours.

1-A—Gathmann ingot with shrinkhead. The shrinkage cavity is all contained in head portion. Billet yield 80 to 86%, body all sound, surface clean.

2-A—Small taper standard mold fitted with shrinkhead, primary pipe contained within the head, axial porosity throughout the body of ingot. Billet yield 75% to 82%, body 20% sound, surface clean.

1-B—Gathmann big-end-up ingot without shrinkhead, primary pipe 25%, billet yield 65 to 70%, body below pipe all sound, clean surface.

2-B—Standard big-end-down ingot, primary pipe 33%. Billet yield 40 to 60%, axial porosity throughout body, surface clean.

Normal pouring and mold temperature used in casting all of these ingots.

Chart showing sections and average yields of ingots made of semi-deoxidized steel cast in big-end-up and big-end-down mold contours.

1-C—Big-end-up Gathmann ingot without shrinkhead, primary pipe 15%, secondary pipe 5%, blowhole zones throughout 25% of upper portion of ingot, balance of steel fairly sound. Billet yield 70 to 75%, surface medium, suitable pouring and mold temperatures.

2-C—Big-end-down ingot produced under same conditions as 1-C, primary pipe 25%, secondary pipe extends throughout body of ingot, upper 25% of ingot pitted with blowholes, billet yield 65 to 70%, no sound steel, surface fairly clean. Suitable pouring mold and temperatures.

3-C—Big-end-down standard ingot, no primary pipe, steel slightly risen—one to three inches, secondary pipe throughout body, blowholes in upper 33% of body, billet yield 80 to 85%, mostly dirty unsound steel, surface seamed to some extent. This ingot was poured at too high a temperature.

4-C—Standard big-end-down ingot, primary pipe 15%, steel risen 4 or 5", secondary pipe throughout the body. Blowholes in the upper 60% of the ingot, billet yield variable 40 to 85%, steel very dirty, many deep seams on surface. This ingot was poured too cold.

Chart showing conditions and average yields of ingots made in big-end-up and big-end-down contours from ordinary open or rimming steel, no silicon, no aluminum in the ladle, but some used in molds.

1-D—Gathmann ingot without shrinkhead, primary pipe 5%, no secondary pipe, bottom outer zones of blowholes throughout 33% of bottom of ingot by volume, inner blowholes well spaced, billet yield 88 to 92%, ingot has thick skin and sound surface. Suitable pouring and mold temperature employed in production of this ingot.

2-D—Small taper big-end-down ingot, primary pipe 5%, slight secondary pipe about 5%, outer blowholes throughout 40% of bottom by volume, inner blowholes well spaced, billet yield 85 to 92%, thick skin and sound surface. Suitable pouring and mold temperature.

3-D—Standard big-end-down mold, primary pipe 10%, secondary pipe 60%, outer zones of blowholes extend throughout 50% of bottom by volume, inner blowholes fairly close. Billet yield 70 to 90%, thin skin $\frac{1}{4}$ to $\frac{3}{4}$ ", surface somewhat porous. Metal was poured in a hot mold and fell after rising 8 or 6 inches.

4-D—Standard big-end-down ingot, no pipe but pitted with skin blowholes from bottom to top, inner zones of blowholes too close to surface, rise in mold 6 to 8", billet yield 30 to 60%, ingot very thin skin averaging $\frac{1}{4}$ ", surface very porous and snaky. Metal was poured too cold and in a cold mold.

Write and make your reservation for our book
"INGOT CONTOUR AND ITS RELATION TO SOUND STEEL"
(2nd Edition—1935)



THE GATHMANN ENGINEERING COMPANY

DESIGNERS OF
INGOTS AND MOLDS SINCE 1909

BALTIMORE, MARYLAND



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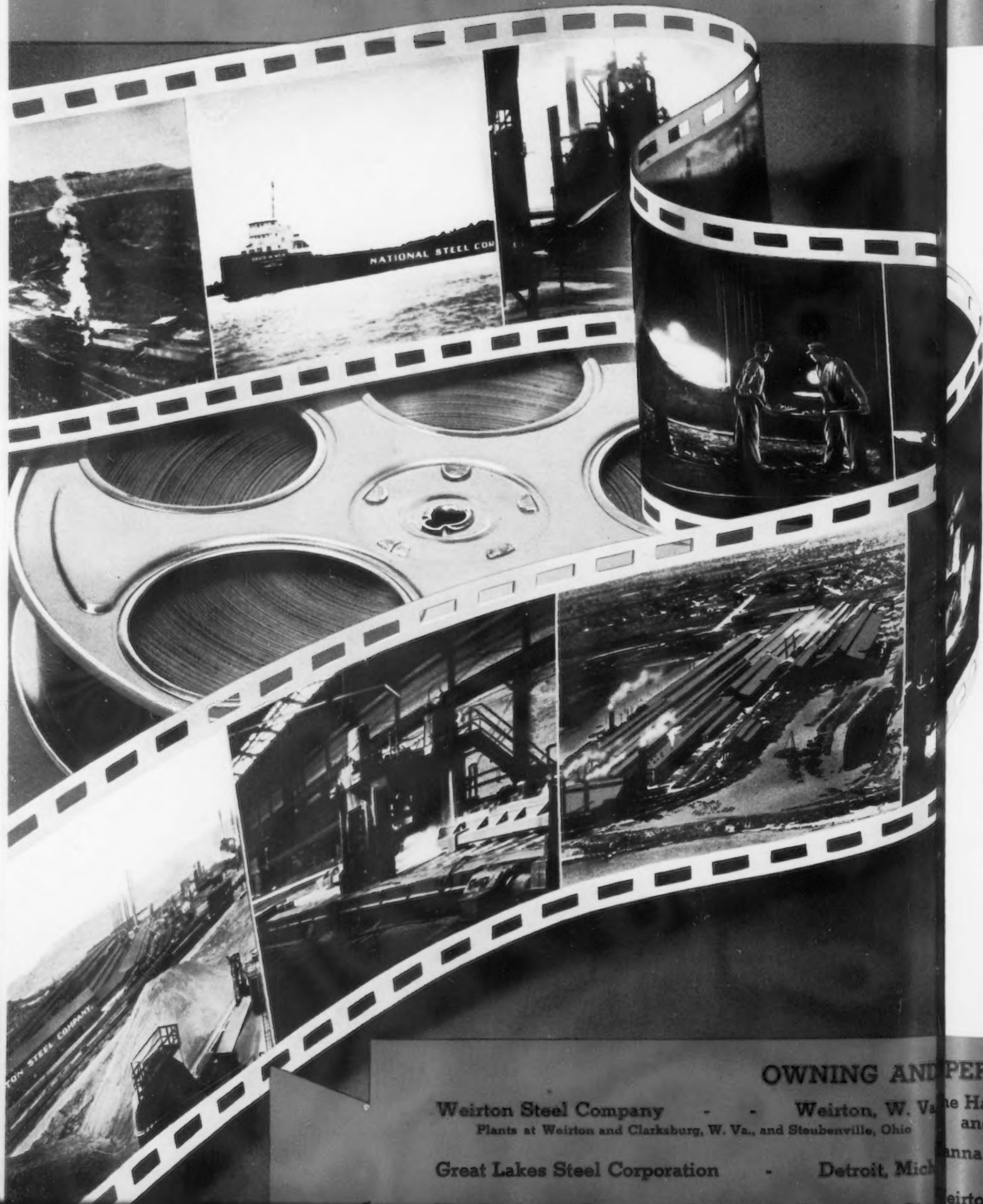
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YOUNGSTOWN, OHIO

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Great Lakes Steel Corporation - - Detroit, Mich. anna

Cleveland, Ohio Weirto

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PITTSBURGH, PA. •

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IF the activities of the National Steel Corporation were to be filmed, the resulting moving picture would present a complete story of steel making.

First you would see on the screen a vast panorama of ore mines . . . the properties of the Hanna Iron Ore Company, supplying its parent corporation with raw material.

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High Phos and Manganiferous Ore			
Basic Pig Iron	Silvery Pig Iron		
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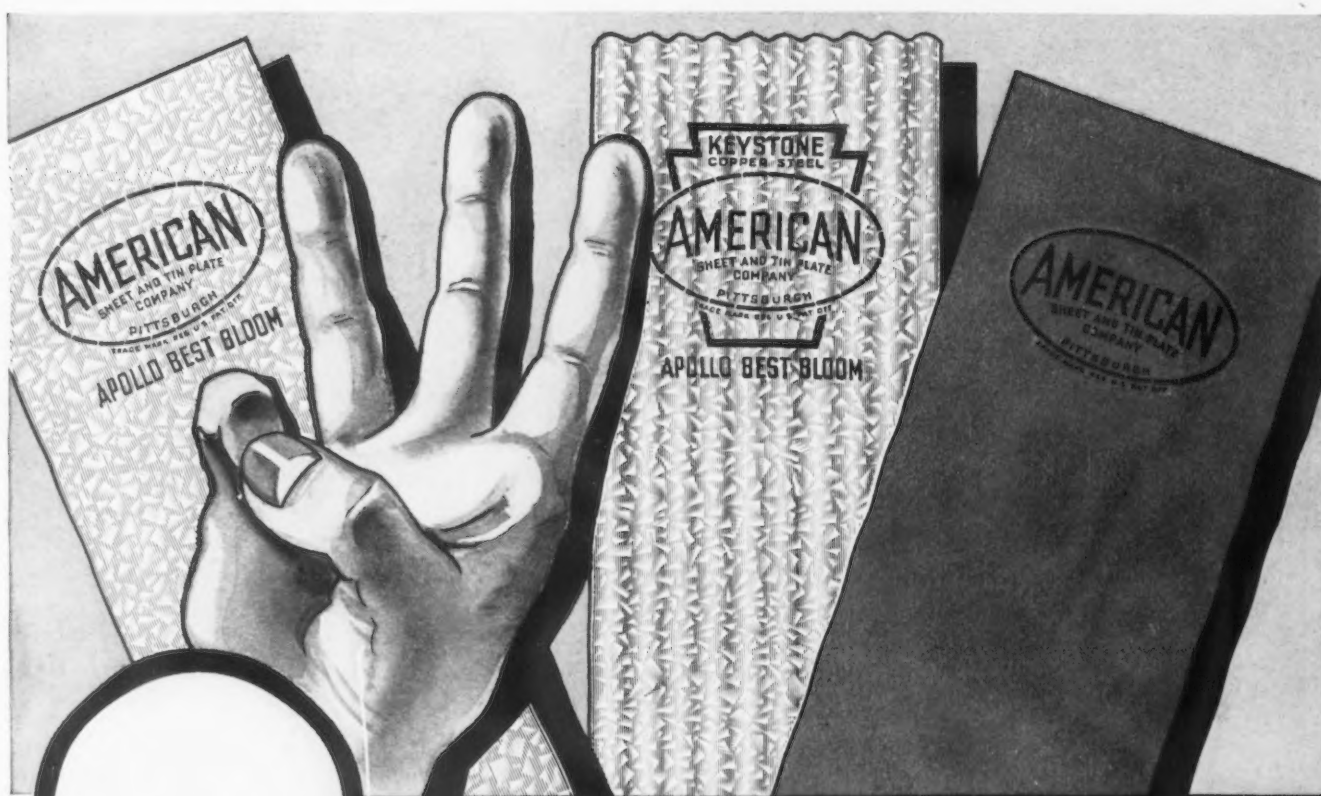
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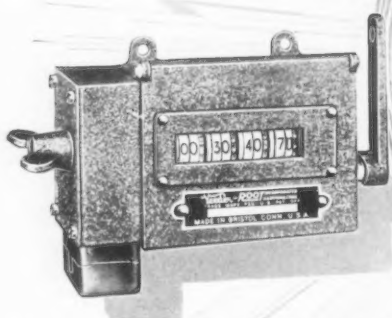
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**Over-runs
Under-runs
Time-Loss
Material-waste**

Ask about applications

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HARTFORD, CONNECTICUT.



On October 8, 1871
Mrs. O'Leary's Cow
Started Something



GRAIN SIZE CONTROL GRAIN SIZE CONTROL GRAIN SIZE CONTROL

In October, 1933, we, too, started something. Several years had been devoted to research and experimentation, not only in our own laboratories but in cooperation with many steel users in diversified lines. Finally all was in readiness. Hundreds of heats of steel had definitely proved our contentions. So, at the National Metal Exposition in Detroit, October, 1933, we announced our ability to positively and systematically control austenitic grain size in the manufacture of open hearth carbon steels for forging and heat treating. It was like a spark applied to dry tinder. Steel users immediately recognized the broadened field of usefulness for these comparatively low-cost steels, and enthusiastically welcomed this development. Grain Size Control! The chorus was growing! At the October, 1934, meeting of the American Society for Metals, grain size control was the *vital* topic of discussion!

Our first year has been marked by extensive applications and continued experimentations. Further improvements in control methods have been made. If you have not studied this truly important development in relation to your own steel requirements, talk it over with our metallurgists. Literature is also available.

CARNEGIE STEEL COMPANY

Subsidiary of United States Steel Corporation

PITTSBURGH



Now



★ STRUCTURED

COLD FINISHED STEEL BARS

**assure you uniform
manufacturing results**

★ LaSalle Structured Steel is steel in which uniformity from lot to lot and from heat to heat is assured by the technique and control exercised in its making, rolling and drawing.

● Through five years of careful study, LaSalle has perfected a technique for assuring maximum uniformity of the desired qualities in each chemical grade of Cold Finished Steel Bars.

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LaSalle STRUCTURED Cold Finished Steel Bars are now available in any desired chemical analysis at no advance in price.



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OPEN HEARTH STEEL SHEETS COMMERCIAL, COPPER-BEARING AND "KONIK"

Hot Rolled	Super Metal
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Hot Rolled Pickled	Long Ternes
Hot Rolled Deoxidized	Galvanized Sheets
Galvannealed	Galvanized Roofing

THE SUPERIOR SHEET STEEL COMPANY
Division of Continental Steel Corporation
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CONTINENTAL STEEL

Sheet Steel and Wire Products!

★ CONTINENTAL Steel Sheets and Wire Products of All Kinds

● Continental open hearth steel wire for manufacturing needs is offered in standard commercial grades, copper-bearing, or Konik Metal. It is especially adapted to all types of manufacturing requirements, and can be supplied in special analyses to meet the most exacting specifications. It is finished either bright, annealed, processed, or galvanized, and can be supplied in coils or straightened and cut. Sizes range from 23 gauge to $\frac{5}{8}$ -inch. Shaped wire for special needs can also be furnished in round, half round, oval, half oval, square, triangular, flat with either round or square edge, and pear-shaped designed. Konik metal is highly recommended for case hardening.

OPEN HEARTH STEEL

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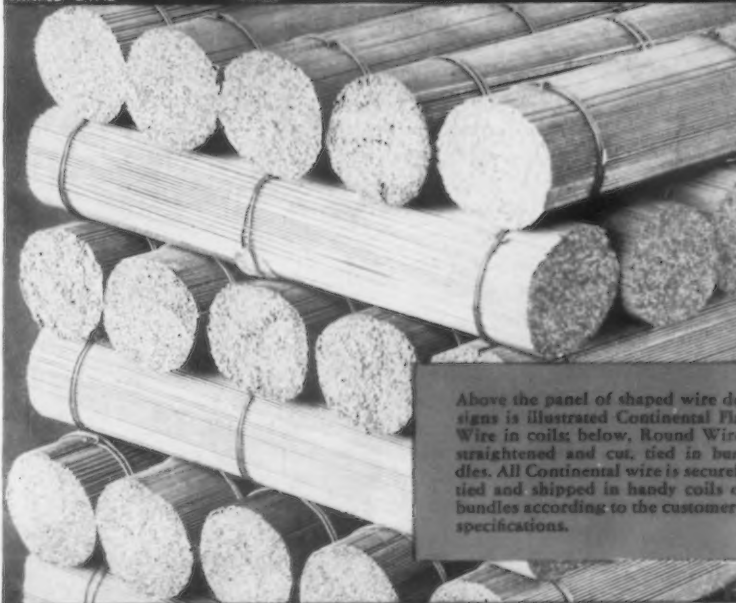
Billets	Gates and Posts
Wire Rods	Hot Rolled Sheets
Bright Basic, Annealed	Hot Rolled Annealed
Konik and Galvanized	Sheets
Wire	Cold Rolled Sheets
Nails	Special Blue Sheets
Staples	Uniform Blue Sheets
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Plants at Canton, Kokomo and Indianapolis

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CORPORATION U.S.A.

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★ ABOUT THE VARIOUS GRADES OF

★ ARMCO IRON AND STEEL

★ SHEETS • STRIPS • PLATES • SPIRAL WELDED PIPE



HOT ROLLED SHEETS

Armco Hot Rolled Sheets may be specified in either rust-resisting INGOT IRON or steel. Both grades are ductile and weldable. These sheets are rolled on the Armco-invented continuous mills, and have a clean, smooth surface obtained only by this perfected process. Sixteen gage and heavier in all commercial sheet sizes.

HOT ROLLED ANNEALED SHEETS

This grade has all the good surface qualities of Armco Hot Rolled Sheets, and is further annealed in pyrometrically-controlled furnaces to insure dependable uniformity and easy working qualities. Available in either INGOT IRON or Steel in 17 gage and lighter. All commercial sheet sizes.

HOT ROLLED STRIP

Supplied in both steel and INGOT IRON in coils as well as cut lengths. Surface is clean and smooth, while working qualities are unsurpassed. Widths under 24 inches.

COLD ROLLED SHEETS

This is another of the sheet products that Armco pioneered 30 years ago, and has since perfected to a notable degree. Analysis, temper and surface of Armco Cold-Rolled Sheets are carefully adapted to individual requirements, while unusually close control is exercised in processing, from open hearth to finishing mills. A custom-made product for the most exacting needs of fabricators. Supplied in the widest range of sizes and available in all standard gages.

COLD ROLLED STRIP

Armco Cold Rolled Strip possesses all the advantages of the companion cold rolled sheets—correct analysis, just the right temper for low-cost fabrication, and remarkably fine surface. Very satisfactory, especially where surface and thickness requirements are severe. Armco applies the same close control to the manufacture of this grade as to other cold rolled steel products. The favorite steel of the stamping industry, because it cuts production costs and improves appearance of the finished product. Available in both coils and cut lengths under 24 inches in width. All standard gages.

GALVANIZED INGOT IRON

The original low-cost, rust-resisting iron, highly refined and made to a guaranteed analysis. The galvanized coating is full weight, tightly adherent, bright and attractive. Noted for its easy-working qualities. Made in all standard sizes and gages and stencilled with the blue Armco triangle trademark. This trademark has behind it 20 years of consistent national advertising, which offers a strong resale value to manufacturers.

GALVANIZED STEEL SHEETS

In addition to galvanized INGOT IRON, The American Rolling Mill Company also manufactures high-grade galvanized steel and copper-bearing steel sheets, noted for their softness, workability and good appearance. Full weight, adherent, galvanized coating, made in all standard sizes and gages. Armco galvanized steel sheets may satisfactorily be used under all but the most severe service conditions.

CHOOSE THE ONE RIGHT PROFITABLE GRADE

LONG TERNE SHEETS

One of the oldest Armco steel grades and especially well suited for products or parts that must be joined by soldering. The coating makes the metal flow readily under dies and therefore extends die life. Made in exacting tempers to meet particular requirements. Armco INGOT IRON Long Terne Sheets, known as "Alloy Coated," are extensively used in the metallic casket industry.

ELECTRICAL SHEET STEEL

Whatever your requirements for electrical sheet steel, they can be met fully from Armco grades, ranging from the highest-quality sheets for precision purposes to the lower utilitarian grades. Armco grades are marked by consistently high magnetic efficiency, excellent punching qualities, and desirable flatness for efficient stacking. There is a correct grade and finish for every requirement: transformers, generators, motors, rotating machines, radio transformers, and other electrical machines. In the "TRAN-COR" Finish grades, objectionable scale is removed leaving a smooth sheet of exceptional space factor. Full range of sizes and gages.

ARMCO ENAMELING IRON

"The World's Standard Enameling Iron"—an improved highly-refined iron with a surface scientifically processed to bond firmly and smoothly with porcelain enamel. Eliminates most of the common base metal troubles, reduces sagging to minimum while firing at high temperatures, and has exceptionally good forming qualities. Special grades for flat work, deep drawing, extra deep drawing, and for blanks that must be spun before enameling. The all-round, all-purpose stock for low-cost, profitable enameling.

ARMCO STAINLESS STEELS

The two most widely-used and generally applicable grades of stainless steel—Armco 18-8 and Armco 17—in sheets, strip, and plates. Resistant to many forms of chemical corrosion; resistant to heat and scaling at elevated temperatures; sanitary, attractive, easy to clean and keep clean. Provide lightweight construction with high tensile strength. Can readily be

sheared and punched, deep drawn and formed, welded, riveted, soldered, and spun. A correct finish for every purpose, from Hot-Rolled, Annealed and Pickled Finish to High Lustre Polish.

ROOFING AND SIDING

All the most popular styles of galvanized roofing formed from rust-resisting INGOT IRON as well as steel and copper-bearing steel sheets. Among these are corrugated, roll pressed standing seam, V-crimp roofings, and corrugated, plain pressed brick, and weather-board sidings.

Other special styles are also manufactured, using Armco iron and steel sheets. All standard sizes and gages.

TIN MILL BLACK PLATE

A light-gage, hot-rolled sheet with unusually good surface. Embosses readily and well suited for smooth paint and lacquer finishes. This grade is widely used in the sign industry because of its uniform flatness and superior surface. Also supplied in pickled and annealed, full finish, and other special tin mill grades. Rolled to 30 gage and heavier in all commercial tin mill sizes.

ARMCO SPIRAL WELDED PIPE

A strong, easy-handling pipe welded helically by a precision automatic process. Manufactured in diameters from 6 to 24 inches, in varying wall thicknesses up to $\frac{1}{4}$ inch. Exceptionally well suited for air lines, water supply, exhaust steam, gas-gathering lines, and other industrial uses. Remarkably easy to assemble and install.

Standard couplings or connections may be used, or the pipe may readily be field-welded. Fittings made to specification for the most complicated job. Pipe shipped mill-coated, asphalt-dipped or galvanized, while special coatings can be supplied to order. Also Armco Spiral-Welded Dredge Pipe, manufactured from a highly abrasion-resisting steel. The ideal pipe for low-cost industrial installations.

THE AMERICAN ROLLING MILL COMPANY

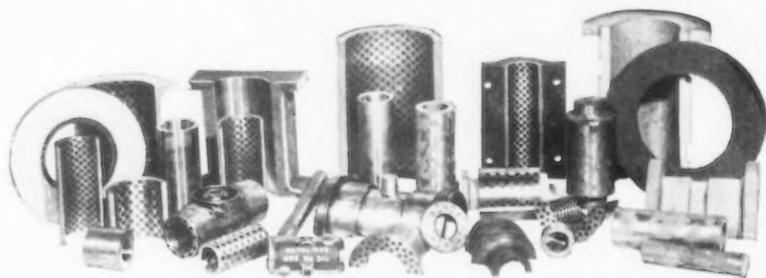
Executive Offices: Middletown, Ohio

DISTRICT OFFICES: Boston, Mass.; Chicago, Ill.; Cleveland, Ohio; Detroit, Mich.; New York, N. Y.; Philadelphia, Pa.; Pittsburgh, Pa.; San Francisco, Cal.; St. Louis, Mo.; Buffalo, N. Y.; Atlanta, Ga.

THE ARMCO INTERNATIONAL CORP., Middletown, Ohio

FROM THE 307 GRADES ARMCO MAKES

METALINE OILLESS BEARINGS



R. W. RHOADES METALINE CO., INC.

Hundreds of Rhoades' customers have found Metaline Oilless Bearings a solution to their lubricating problems. Sand-cast bronze finished all over, and rendered oilless by the insertion of Metaline, they are ready for immediate installation. There is a special grade of Metaline for use where, due to excessive heat, oil cannot be used.

Let Rhoades help you when you experience bearing trouble. Metaline Oilless Bearings are made in standard sizes and to your specifications.

P. O. BOX No. 1
LONG ISLAND CITY, N. Y.

DOING ONE THING WELL

PRODUCING THE BEST INHIBITORS

AT THE FAIREST PRICE FOR 20 YEARS

NEP powder 100

NEP No. 22

SUM-FOAM

THE W^M. M. PARKIN COMPANY

Chemical Engineers in Steel

Since 1860 in Steel

Pittsburgh, Penna.

MIDVALE



LEAVING behind a year that has tested severely every phase of industry. Looking ahead to a year which promises further testing, but also hopeful possibilities. Wherever difficult problems require better answers—better tools and better materials are essential to success.

In the year 1935 Midvale hopes you will find such tools and materials readily available. And wherever steel and its alloys fit into your picture Midvale promises to individual or industry such wholehearted aid as will help bring success.

THE MIDVALE COMPANY
NICETOWN, PHILADELPHIA



Offices: NEW YORK—CHICAGO—PITTSBURGH—WASHINGTON—CLEVELAND—SAN FRANCISCO

SERVICE RECORDS *count most!*

In the choice of boiler tubes, nothing deserves more consideration than service records. What the tubes have done in the past under the most trying conditions of use, points quite definitely to the right selection. Experienced users of boiler tubes in the Railway, Marine, and Power Plant fields well know the long, satisfactory service given by NATIONAL Seamless Boiler Tubes. In specifying these tubes they know that they can count on the *highest degree of reliability*—they are not taking chances on either materials or methods.

The reasons for such proved performance, when well weighed, are convincing. First, and most important, a NATIONAL Seamless Boiler Tube has no weld—no long line of possible weakness. It is pierced from solid steel! And no other method yet devised, however ingeniously employed, can provide, with invariable certainty, the structural homogeneity of a solid forging. One continuous hollow cylinder, expanded and rolled at proper and definitely controlled temperatures to produce uniform grain refinement and uniform transverse and longitudinal strength—that's NATIONAL Seamless!

There are other reasons. See the list to the right. And NATIONAL Seamless Boiler Tubes comply, of course, with all recognized specifications—water-tube or fire-tube boilers. For strength, safety and economy, standardize on NATIONAL—

America's Preferred Boiler Tubes

NATIONAL TUBE COMPANY • Pittsburgh, Pa.

Subsidiary of United States Steel Corporation

Pacific Coast Distributors • COLUMBIA STEEL CO. • San Francisco, Calif.

CHECK THESE REASONS WHY NATIONAL TUBES LAST LONGER

- ✓ Seamless—no uncertainty about full wall strength in every tube.
- ✓ Higher creep strength—only "killed" open hearth steel used.
- ✓ Uniform density and soundness—improved heat transfer characteristics.
- ✓ Exceptional ductility—readily manipulated—lowest installation costs.
- ✓ Dependable uniformity insured by careful metallurgical supervision.
- ✓ Thirty-five years' proved performance under exacting service.
- ✓ Comply with all recognized specifications—water-tube or fire-tube boilers.
- ✓ Product of America's largest manufacturer of seamless pipe and tubes.



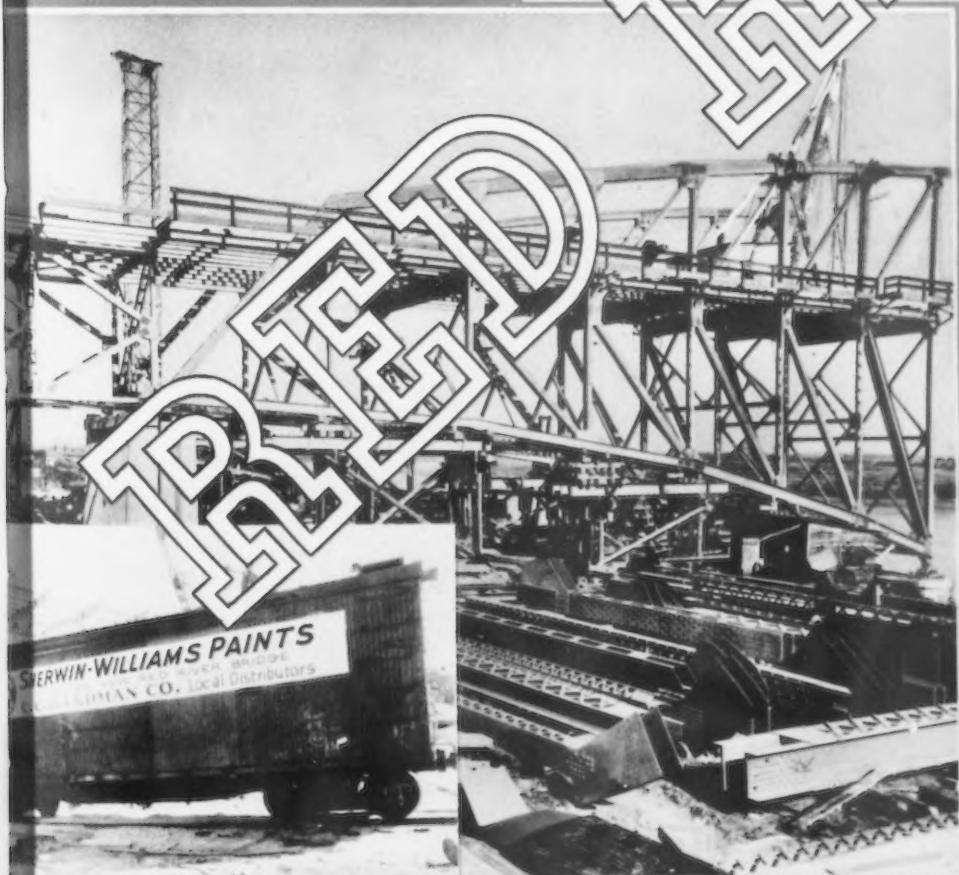
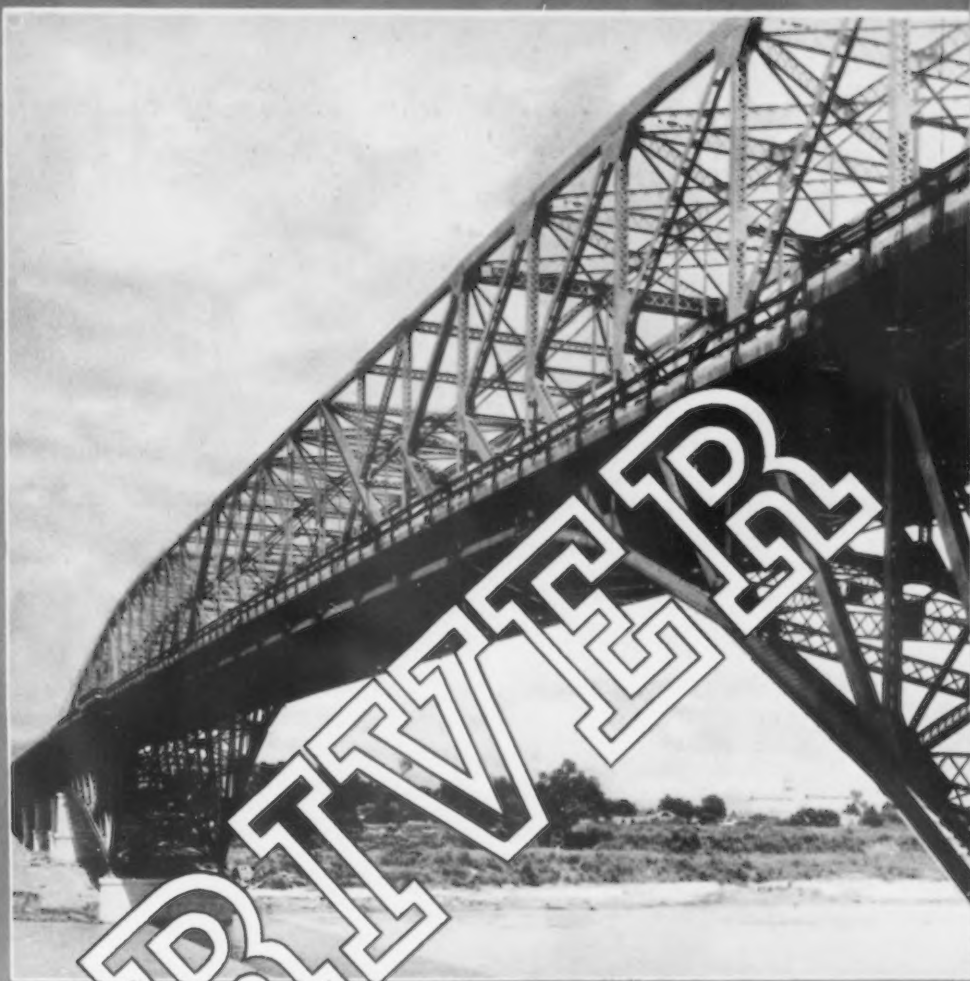
NATIONAL SEAMLESS

BOILER TUBES—SAFE ENDS—SUPERHEATER TUBES—CONDENSER TUBING—ARCH TUBES—SUPERHEATER PIPES—STAY-BOLT MATERIAL

Rust Ruins PAINT PAYS

Red River Bridge at Shreveport, La., is covered with Sherwin-Williams Metal Protective Paints. Covered to the extent of about 2500 gallons, it is fully protected.

REMEMBER THIS: The ravages of rust—running into billions of dollars annually—have never been too greatly stressed. Paint for protection is a paint-for-profit expenditure. Your structure is your basic investment. Paint is its first and most constant guardian.



Sherwin-Williams

KROMIK and METALASTIC

Kromik Metal Primer brushes easily and has excellent covering capacity, assuring an economical paint. It is built on a lead chromate base and is unexcelled in its power to inhibit corrosion. It has strong normal drying properties, and the film will stand a lot of abuse. (The film is resistant to moisture and gaseous penetration.) Metalastic field coat contains a large percentage of graphite and carbon, and in all colors the pigments are balanced to produce a paint that brushes out correctly and forms a tight film. It is obtainable in brown, grey, green or black.

See the
Sherwin-Williams
Paint Engineer



SHERWIN-WILLIAMS PAINTS

METAL PROTECTIVE FINISHES





SHERWIN-WILLIAMS PAINTS



HIRAM WALKER

PEORIA, ILL.

All structural steel and iron work at the world's largest distillery, Hiram Walker's at Peoria, Ill., is protected with Sherwin-Williams Kromik Metal Primer and with Metalastic Field Coat. It's a huge job—it *must* be, to thoroughly protect a plant of such proportions. It covers 22 acres of ground, has a daily capacity of 100,000 gallons and a bottling capacity of 10,000 cases of quarts every 7-hour day. Much of the painting had to be carried on during adverse winter weather conditions, but thanks to the good paint and good painting (Val Jobst and Son were the contractors), an outstanding job was done. Some four thousand tons of structural steel, as well as 2,000 tons of plate employed in tank construction, were given a prime and finish coat. Both Hiram Walker and Sherwin-Williams are proud of the job.

FREE BOOKS



Check the Sherwin-Williams painting booklets most interesting to you. They will be promptly forwarded.

- 1 Plant Interiors.
- 2 Plant Exteriors.
- 3 Metal Protection.
- 4 Product Finishing—Metal.
- 5 Product Finishing—Wood.
- 6 Bus Finishing.
- 7 Truck Finishing.
- 8 Aluminum Paint.

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PHILCO

PHILADELPHIA, PA.

A visit to the Philco Radio and Television Company's plant in Philadelphia is a visit to a beehive. Production is at higher levels than ever before. In the cabinet plant Sherwin-Williams lacquers are part and parcel of this beehive activity. Fillers, first coats, second coats, and soft transparent finishing lacquers are part of the preparation of the finished Philco that may grace your home. You would be amazed at the hand finishing that goes into each cabinet—amazed also at the speed and dispatch with which cabinets are turned out.

BETTER LIGHT BETTER SIGHT

NEW YORK CITY

On the authority of the Better Vision Institute, 85% of all we know comes to us through eyes. Our working and living depend upon them. How to aid them to the fullest? With light, enough light. How to get enough light? See that daylight and artificial light are reflected to the fullest extent. How to do this? As Beechnut Packing, Kendall Mills, Breyer's Ice Cream and other industrial leaders do it . . . by seeing that wall and ceiling surfaces are painted with Save-Lite Mill White.

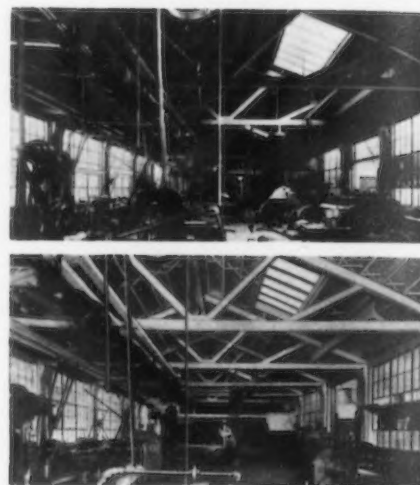
SAVE-LITE

SAVE SIGHT

"Specially formulated for your industry." These five words cover a wealth of experience, research and production. You may have a fume resisting problem; a dust retention problem. You may need a paint that is heat resistant. In your industry a washable gloss may be vital; in someone else's an egg-shell combination of the properties of gloss and flat wall paints is equally necessary. Perhaps you don't know the proper paint for your application. The five words mentioned cover all of the years of The Sherwin-Williams Company's efforts on all paint problems. Breadth of experience means specific answers to your individual problems.

RAFTER

BELLEVILLE, N. J.



Saving light and sight with another Sherwin-Williams Save-Lite job. Rafter Machine Co., Belleville, N. J.

ANSWERS

1 White paint has the highest light reflection value—much higher than aluminum.

2 White paint also has a higher heat reflection value than any other. This means vital saving in gallonage losses of volatile liquids exposed to the sun's rays or other high heat sources.

3 The Mauretania, crack English liner, made heat tests on two Caribbean cruises. When the hull was painted white, the ship was ten degrees cooler than under ordinary dark colors.

4 Westinghouse Electric and Procter and Gamble put all maintenance painting on a time-study and production basis. The savings ran into thousands of dollars yearly.

5 Watch color. It is going to be used to an ever-increasing extent in painting.

6 Be sure to know how to prepare a surface for paint as well as how to paint it. Sherwin-Williams paint engineers will give you good counsel in this regard.

THE SHERWIN-WILLIAMS CO.

ADMINISTRATION OFFICES: CLEVELAND, OHIO

Sales offices, factories and warehouses in principal cities



Sher-
er Ma-

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reflec-
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heat re-
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**UNIVERSAL STEEL COMPANY
AND CYCLOPS STEEL COMPANY**

present

MoTUNG

A NEW HIGH SPEED STEEL



MoTung High Speed Steel, a tungsten-content molybdenum-base steel made by Universal Steel Company and Cyclops Steel Company, has been in successful service in scores of applications for about three years. It is now available—as a carefully tested product—to all users of high speed steel.

Molybdenum, the essential material, is mined in the United States. Inventory losses resulting from price fluctuations due to foreign influences are minimized, and ample supplies in times of emergency are assured.

The use of molybdenum for cutting tools has been established for many years. In fact, molybdenum steels were used for this purpose as early as 1896. However, it remained for our technical staffs to discover a balance of composition and develop the proper treatment to make possible its practical application in the field of modern high speed steels.

MoTung has proved to be equal to, or better than, 18-4-1 tungsten high speed steel in cutting performance in all applications made to

date. It has shown a marked superiority where toughness, high abrasive resistance, and torque are required. Its ability to withstand abuse in service has been demonstrated beyond a doubt.

In addition, **MoTung** has certain other important advantages. The fact that it has a lower alloy-content and weighs approximately 9 per cent less than the more conventional 18-4-1 steel, provides worthwhile economies. Heat treating is performed at lower temperatures. It works easier, and grinds and machines more readily than other high speed steels.

Universal Steel Company and Cyclops Steel Company in presenting the **MoTung** brand of MoMax High Speed Steel (Emmons Patent No. 1,937,334) desire to co-operate with tool manufacturers and users of tool steels to the end that **MoTung** may be prepared and used in the ways which will assure maximum performance with a minimum of cost and time-consuming investigations. Complete data on **MoTung** will be forwarded on request.




UNIVERSAL STEEL COMPANY AND CYCLOPS STEEL COMPANY
BRIDGEVILLE, PA. TITUSVILLE, PA.

Sales Offices: Chicago • Cleveland • Detroit • Hartford • Indianapolis • Los Angeles • Milwaukee • Norfolk
New York • Philadelphia • Pittsburgh • San Francisco • St. Louis • Syracuse • Toronto • Washington • Worcester

Warehouses: Bridgeville • Titusville • Chicago • Detroit • Worcester

1066

Do a BETTER



Every dashboard of one make of automobile is enhanced by two of these bright ornaments. They were made of Carpenter Stainless Steel at a cost lower than that of plated stampings or plated castings. Their finish and color are better. And their beauty will not fade before the car is discarded. See drawings D, E and F on opposite page.

THESE simple ideas can be used to improve the appearance and salability of hundreds of different products—maybe yours. Both these pieces cost less than plated substitutes that might fail after a couple of years of hard use.

Both of them are far better, too, because they're Carpenter Stainless Steel clear through. You could polish them hundreds of times and you'd always get the same beautifully polished surface.

Cost is low on them because they were designed for Stainless Steel right from the start—keeping in mind the easy-working qualities of

Carpenter Stainless Steel Strip and the high quality finishes in which Carpenter now offers it.

If you want to get the advantages of Stainless Steel for your own products and parts, design them from the start for Stainless. Don't try to adapt old designs and patterns to it if you're seriously after lower costs.

We offer you help in your work with Stainless Steel—a handy, pocket-size slide chart that gives you at a glance a summary of technical data on all stainless steels. You'll find it very useful. Send the coupon below and get one for your desk—free, of course.

THE CARPENTER STEEL COMPANY • READING, PA.
Licensee of American Stainless Steel Company, and of Chemical Foundation, Inc.



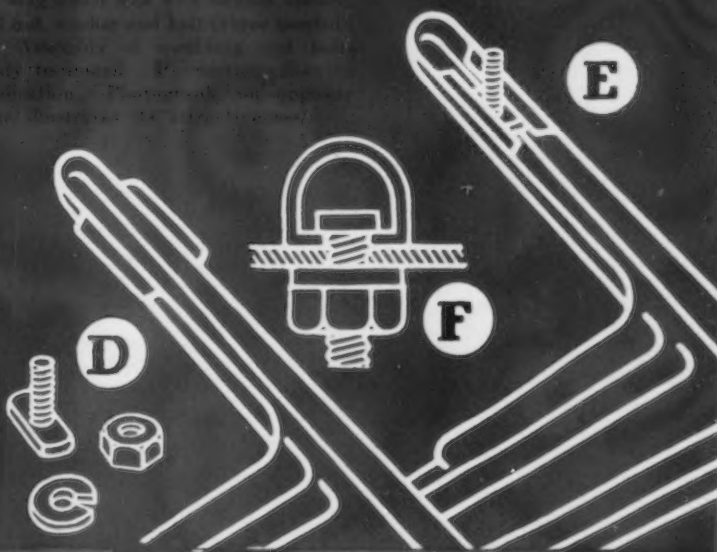
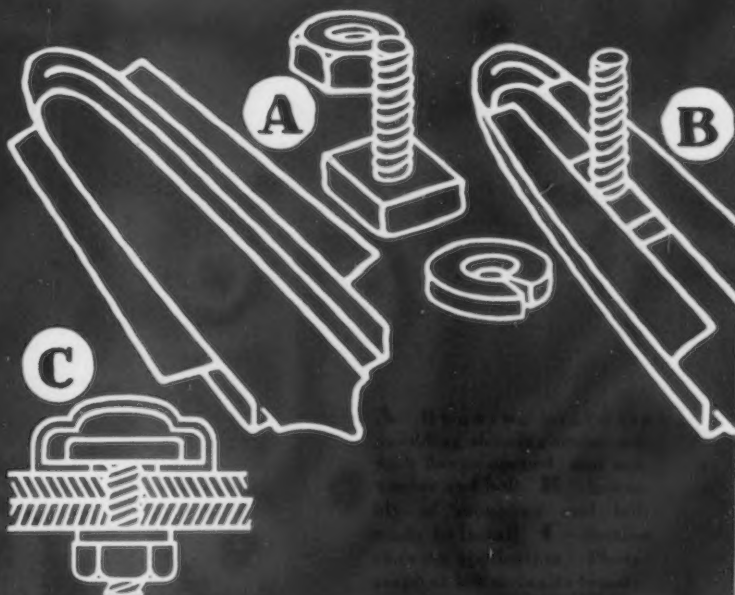
YOU'LL DO THE
JOB **EASIER** WITH
Carpenter
STAINLESS STEEL

Carpenter STAINLESS

job CHEAPER

...with STAINLESS STEEL

Gritty shoes will scrape roughly over these running board tip mouldings . . . thousands of times in the life of the car . . . more than enough to take off the best plating job that could be used. But they are made of Carpenter Stainless Steel . . . they're the same solid metal clear through . . . they'll always look bright—and they cost less than plated substitutes. See drawings A, B and C to right.



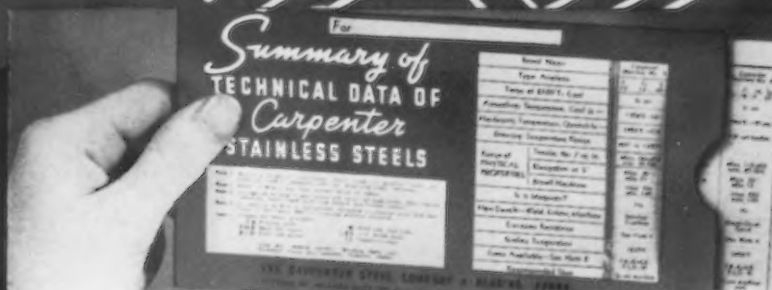
(See A, B, C)

With this simple device for fastening running board tip mouldings—flanges under a flat-headed bolt—a minimum amount of material is used and costs are kept down. They are easy to put on, too. What a lot of effective trim for just a few pennies.

(See D, E, F)

The installation of this trim is very simple. Its design utilizes the minimum amount of Stainless Steel per piece, to get the greatest possible decorative value. The price is kept low because it was designed from the beginning for Stainless Steel.

SEND THIS COUPON NOW



The Carpenter Steel Co., 121 West Bern St., Reading, Pa.

Please send me your free pocket-size slide chart on stainless steel, immediately. Thank you.

Name..... Title.....

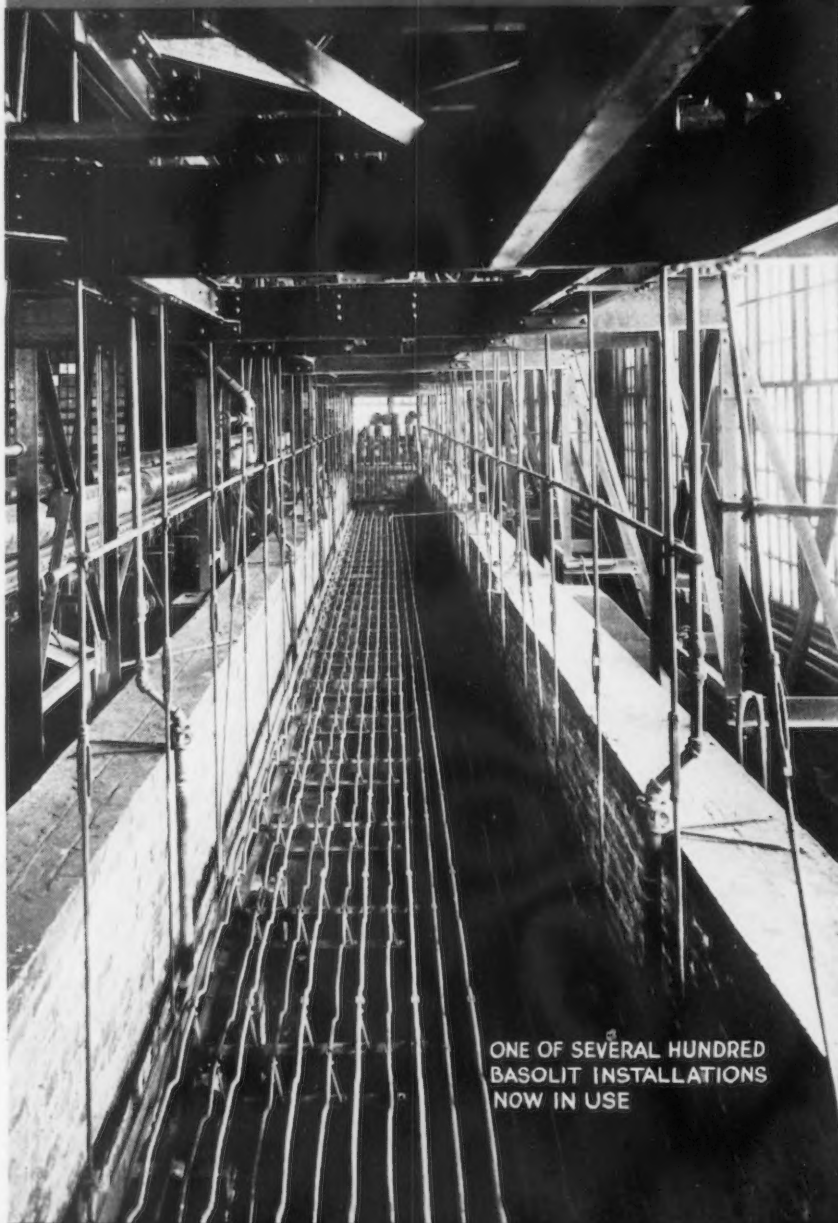
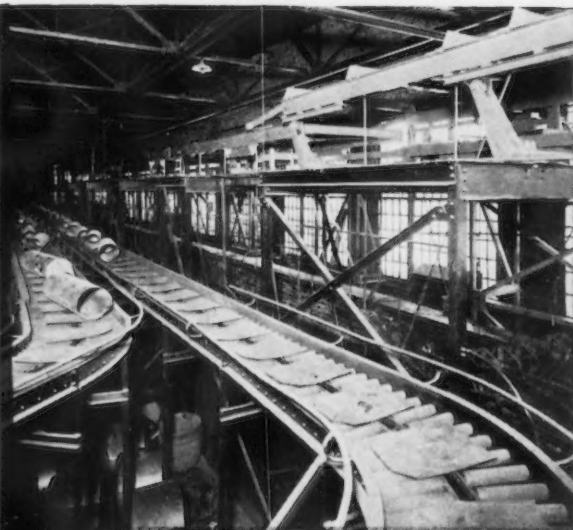
Firm Name.....

Street and Number.....

STAINLESS STEELS

BASOLIT

*Pickling Tanks
for Durability*



ONE OF SEVERAL HUNDRED
BASOLIT INSTALLATIONS
NOW IN USE

A GLANCE at this pickling tank and its associated handling equipment indicates that tank failure would seriously delay production.

It won't fail, however, because the Pressed Steel Tank Co. of Milwaukee took the precaution to install a Basolit Tank which is wear-proof and leak-proof against all commercial acids. Generally sulphuric acid is used. However, metallurgical advance demands frequent use of nitric, hydrochloric acids, etc. Basolit Tanks are safe whatever your future requirements may be.

This 110 ft. Basolit Pickling Tank is used for pickling 200 to 400 tons weekly of seamless steel shells prior to cold drawing operations. It has been in service for over 4 years, and has well satisfied its user with negligible maintenance cost.

Play safe by specifying "Basolit" for pickling tanks.

*This tank installed Nov., 1930
Photographed Jan., 1934*

NUKEM PRODUCTS CORP., Buffalo, N.Y.

NEW YORK

PITTSBURGH

LOS ANGELES

TORONTO, ONT.

LACLEDE



O. H. FORGING STEEL—Ingots,
Blooms, Billets.

STRIP STEEL—Plain Hot Rolled
or Pickled; cut to length or in long
coils—Barrel Hoop.

PIPE—Black and Galvanized Pipe for
Water, Gas, and Steam—Structural
Pipe.

WIRE—Hot Rolled Rods — Wire —
Cold Heading Stock.

WELDED WIRE MESH

MERCHANT BARS — Angles,
Channels, Shapes, Flats, Rounds and
Squares.

REINFORCING BARS—Rail or
Billet Quality—Plain or Deformed
Fabricated if Required.

CONDUIT—Rigid Electrical, Hot
Dipped Galvanized, and Baked
Enamel—Light Wall Conduit.

FENCE POSTS—Channel and
Angle Type.

STEEL JOISTS — Laclede Open
Web Steel Joists and Accessories.

LACLEDE STEEL COMPANY
LACLEDE TUBE COMPANY
SAINT LOUIS



Sheared Steel
PLATES

Flanged & Dished
HEADS

Hot Rolled
SHEETS



WORTH STEEL COMPANY·CLAYMONT·DE^{EL}.

Service—



CHROMIUM

HIGH-CARBON FERROCHROME
(MAXIMUM 6% CARBON)
LOW-CARBON FERROCHROME
(IN GRADES, MAXIMUM 0.06%
TO MAXIMUM 2.00% CARBON)

CHROMIUM METAL
CHROMIUM-COPPER

MISCELLANEOUS CHROMIUM ALLOYS

SILICON

FERROSILICON 15%
FERROSILICON 50%
FERROSILICON 75%
FERROSILICON 80 TO 85%
FERROSILICON 90 TO 95%

REFINED SILICON
(MINIMUM 97% SILICON)

CALCIUM-SILICON
CALCIUM-ALUMINUM-SILICON
CALCIUM-MANGANESE-SILICON
SILICON-COPPER

MISCELLANEOUS SILICON ALLOYS

MANGANESE

STANDARD FERROMANGANESE 78 TO 82%
LOW-CARBON FERROMANGANESE
MEDIUM-CARBON FERROMANGANESE

MANGANESE METAL
MANGANESE-COPPER

MISCELLANEOUS MANGANESE ALLOYS
SPIEGELEISEN

SILICO-MANGANESE

ALL GRADES INCLUDING SILICO-SPIEGEL

TUNGSTEN

VANADIUM

ALL GRADES

ZIRCONIUM

ALUMINUM-ZIRCONIUM
35 TO 40% ZIRCONIUM
12 TO 15% ZIRCONIUM
ZIRCONIUM-MANGANESE-
SILICON

BRIQUETS

(Patented)

CHROME BRIQUETS
SILICON BRIQUETS
MANGANESE BRIQUETS

with Coats off

To make good alloy steel requires good ferro-alloys. Electro Metallurgical Sales Corporation offers a complete line of ferro-alloys of high quality backed by more than 25 years of experience.

Prompt shipment of all orders is an important part of Electromet Service. It eliminates the necessity of keeping large stocks in your warehouse, and saves you expense and storage space.

The Services of Electromet engineers and Electromet laboratories are available to all users of Electromet products, and will assist in solving any problem involving the use of ferro-alloys.

ELECTRO METALLURGICAL SALES CORP.

Unit of Union Carbide and Carbon Corporation



CARBIDE AND CARBON BUILDING
30 EAST 42ND STREET, NEW YORK, N. Y.



Electromet Ferro-Alloys & Metals



**the
world over!**

**AMERICA
ENGLAND
FRANCE
GERMANY
SWEDEN
ITALY
JAPAN**

**BOFORS
Krupp
FOX
NIPPON
VICKERS
SCHNEIDER
America
BETHLEHEM
MIDVALE
ILLINOIS
and many
others.**

AJAX
NORTHROP

**CORELESS INDUCTION
FURNACES**

AJAX ELECTROTHERMIC CORP., TRENTON, N. J.

G. H. CLAMER, Pres. and Gen. Mgr.

E. F. NORTHROP, V. Pres. and Tech. Adviser

THE CHARACTER OF A COMPANY SHAPES THE SERVICE IT RENDERS.



**J&L
STEEL**

Through the vicissitudes of depressions, panics and wars, Jones & Laughlin has maintained its "independent" character for more than eight decades, prospering solely through its service to the industrial life of the nation.

J&L STEEL PRODUCTS

OPEN HEARTH AND BESSEMER STEEL

HOT ROLLED PRODUCTS

Billets Blooms Slabs Sheet Bars Skelp
Flats Hexagons Rounds Squares

Angles Beams Channels Tees Zees
Agricultural Shapes Special Shapes
Light Weight Channels
Plates for Bridges, Tanks, Boilers, Cars and Ships
Hot Rolled Strip Hot Rolled Sheets

RAILROAD SPIKES TIE PLATES
Light Rails and Accessories

BARS FOR CONCRETE REINFORCEMENT
Straight, Bent and Fabricated

FORGING STEEL

JALCASE STEEL
Hot Rolled Cold Finished

COLD FINISHED STEEL

Rounds Squares Hexagons Flats Special Shapes
Free Cutting Screw Stock
Shafting, in Turned and Ground, Turned and
Polished, and Cold Drawn
Pump and Piston Rods

JUNIOR BEAMS

STEEL PILING

FABRICATED STRUCTURAL WORK

Columns Girders Trusses Plate Work Tanks
Steel Barges Mill and Factory Buildings

TUBULAR PRODUCTS

Standard Pipe Line Pipe
Casing, Tubing, Drive Pipe and Drill Pipe
in Welded and Seamless
Hot Rolled Seamless Boiler Tubes and
Mechanical Tubing

WIRE PRODUCTS

Wire Rods
Bright, Annealed and Galvanized Wire
Spring Wire Barbed Wire Woven Fencing
Bright, Coated and Galvanized Nails
Fence Staples Netting Staples

TIN MILL PRODUCTS

Coke Tin Plate Black Sheets (Tin Mill Sizes)

COKE BY-PRODUCTS

**J&L
STEEL**

Jones & Laughlin serves all major industries, the quality and exceptionally wide variety of its products making **J&L** an important source of supply. Whether you buy steel for product manufacturing, for construction, or for maintenance work, you may look with confidence to **J&L** for the satisfaction of your wants.

JONES & LAUGHLIN STEEL CORPORATION

AMERICAN IRON AND STEEL WORKS
JONES & LAUGHLIN BUILDING, PITTSBURGH, PENNSYLVANIA

GALVANIZING

Galvanizing has for a long time been the accepted trade term for the application of zinc to the surface of iron and steel.

The object of applying zinc to iron and steel is to prevent rust and corrosion. A good coating of zinc properly applied multiplies the life of iron and steel many times.

THE CHEMISTRY OF PROTECTION WITH ZINC*

**From Circular No. 80 U. S. Bureau of Standards*

"Of the metallic coatings, by far the best for general rustproofing is zinc. The principal reason for this lies in the chemical nature of zinc. It is the only one of the commonly used metals that is electronegative to iron—that is, it has a greater tendency to be oxidized than has iron. In the following list the metallic elements are arranged in their proper order in the potential series. Any element is electronegative to any element following and electropositive to any element preceding it in the list:

Potassium
Sodium
Barium
Strontium
Calcium
Magnesium
Aluminum
Manganese
ZINC

Cadmium
IRON
Thallium
Cobalt
Nickel
Tin
Lead
Hydrogen
Copper

Arsenic
Bismuth
Antimony
Mercury
Silver
Platinum
Gold

Therefore, zinc, when applied by the "Hot Dip" Process, is unquestionably the prime protective agency for iron and steel against corrosion, and, of course, since it is the zinc which resists attack by the elements, the life of the material coated depends entirely on the method of applying the coating and the quantity of the coating applied. In other words—the ultimate usefulness or life of galvanized (zinc coated) iron or steel is directly proportional to the quality and to the quantity of the zinc coating and the method by which it is applied.

The corrosion of zinc takes place by the same laws that the corrosion of iron does, BUT AT A VERY MUCH SLOWER RATE. Therefore, the life of Iron or Steel is multiplied by the difference in time that it takes for zinc to corrode as compared with the time that it takes plain iron or steel to corrode.

For real protection against rust and corrosion, have your products **GALVANIZED**, by the **HOT DIP PROCESS**.

NATIONAL GALVANIZERS ASSOCIATION

Acme Steel & Malleable Iron Works,
Buffalo, N. Y.
Chance Company, Centralia, Missouri
Sanitary Tinning Co., Cleveland, Ohio.
Heaney Company, Chicago, Ill.
Rogers Bros. Galvanizing Works, Batavia,
Ill.
Thos. Gregory Galvanizing Company, Mas-
sachusetts, L. I., N. Y.

Ross Galvanizing Works, Brooklyn, N. Y.
Penn Galvanizing Company, Philadelphia,
Pa.
Buffalo Galvanizing & Tinning Works,
Buffalo, N. Y.
Chain Products Co., Cleveland, Ohio.
Delta Star Electric Co., Chicago, Ill.
Joslyn Mfg. & Supply Co., Chicago, Ill.
Standard Galvanizing Co., Chicago, Ill.

L. O. Koven & Bro., Inc., Jersey City, N. J.
Jos. P. Cattie & Bros., Philadelphia, Pa.
Portland Galvanizing Works, Portland,
Oregon.
Hanton-Gregory Galvanizing Co., Pitts-
burgh, Pa.
Jefferson Union Corp., Lockport, N. Y.
National Telephone & Supply Co., Cleve-
land, Ohio.

Empire Metal Products Co., Chicago, Ill.
Rogers Galvanizing Co., Blue Island, Ill.
Acme Galvanizing Company, Milwaukee,
Wisc.
Elliott Galvanizing Co., Jersey City, N. J.
Enterprise Galvanizing Co., Philadelphia,
Pa.
Utility Engr. & Supply Co., St. Louis,
Mo.



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Open Hearth, Electric and Crucible Grades

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15%, 50%, 75%, 80-90%, 90-95%

FERRO-CHROMIUM

High Carbon Grade (4 to 6% carbon). Low Carbon Grades (from maximum .06% carbon to maximum 2% carbon).

FERRO-TITANIUM

High, Medium and Low Carbon Grades

SILICO-MANGANESE

All Grades

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The Ferro-Silicon-Aluminum Deoxidizer Without a Disadvantage.

*Also Special Alloys
of Vanadium, Silicon, Chromium, Etc.*

Large stocks are always maintained for prompt shipment. Write for complete information and prices.

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PITTSBURGH
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CHICAGO

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CLEVELAND

The Cleveland-Cliffs Iron Company, Agents

Plants at Bridgeville, Pa., and Niagara Falls, N. Y.
Research and Development Laboratories at Bridgeville, Pa.

MODERN ILLUMINATION CAN SAVE MONEY IN YOUR PLANT, TOO



THIS plant, formerly inefficient, has been made efficient by the installation of modern lighting. For the sake of contrast, the photo was taken when the new lighting was only partially installed.

Compare the old lighting in the left-hand part of the photo with that on the right. Notice the gloomy, glaring, depressive atmosphere with the old lighting. Its harsh contrasts caused eyestrain, spoilage, and increased production costs as well as accident hazards.

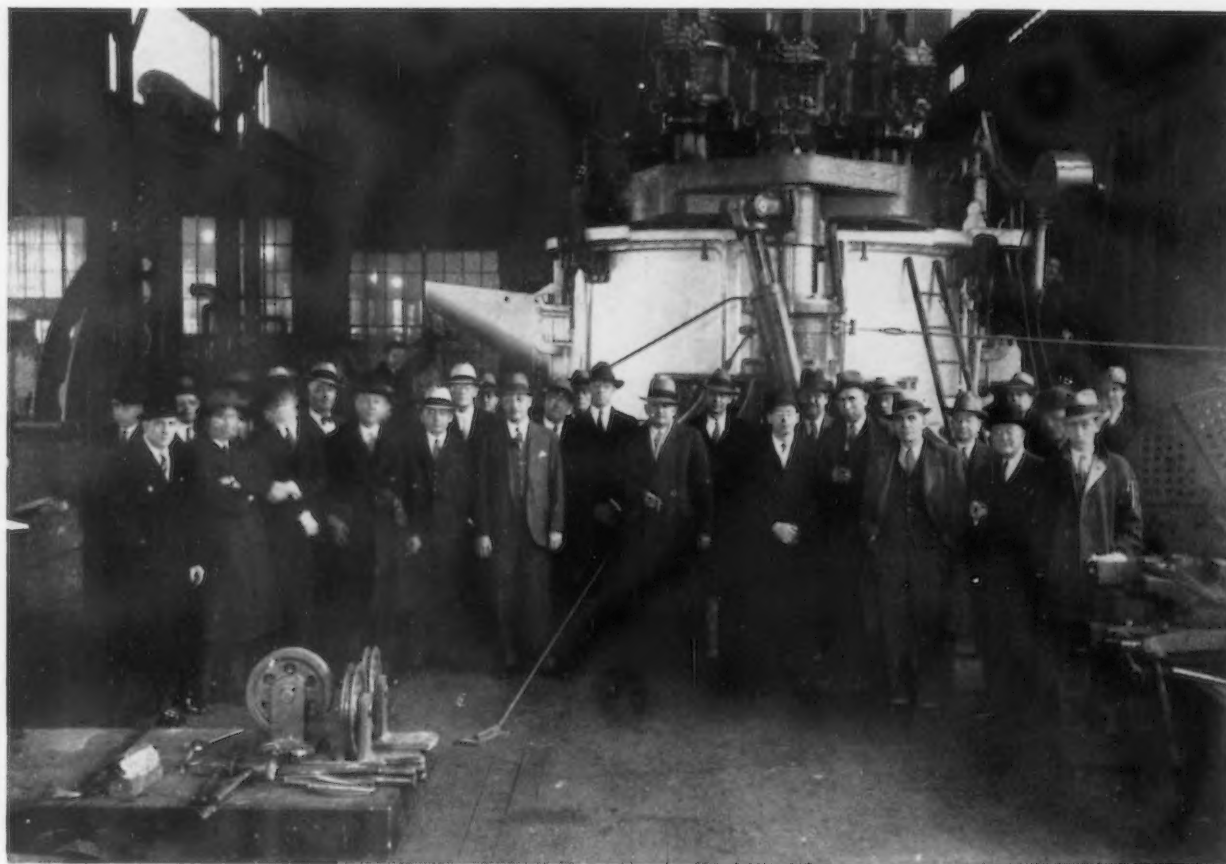
With the new lighting installed, the working environment is brighter and more cheerful, and the workers turn out more and better work with less effort. Accidents have decreased. The cost of the new lighting system has been more than offset by time and money saved in faster, better production and fewer accidents.

We believe that modern lighting can save you money too. We suggest that you let a General Electric Light-

ing Engineer make a lighting survey of your plant (without cost or obligation to you). For more information, write to General Electric Company, Engineering Dept. 166, Nela Park, Cleveland, Ohio.



GENERAL  ELECTRIC
MAZDA LAMPS



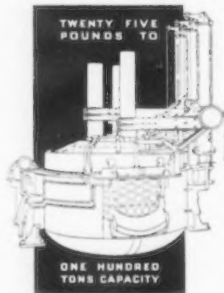
Group View Taken During Shop Tests Before Shipment of a New Twenty Ton Basic Swing Roof Quick-Top Charge Lectromelt Furnace

This equipment supplements a top-charge Lectromelt of the same size, installed in 1929, which has shown the following savings over a fixed roof door charge furnace operated by the same men on the same charges, products and load factor.

THE SAVINGS SHOWN BASIC PRACTICE

5% on power	30% on man hours
14% on electrodes	30% on refractories

Standard Sizes Twenty-five Pounds to One Hundred Tons Capacity. Special Furnaces to Individual Requirements.



Used Daily in 36 States and Canada, Mexico, New Zealand, Chile, Spain, Russia, China, Colombia, Sweden, Etc.

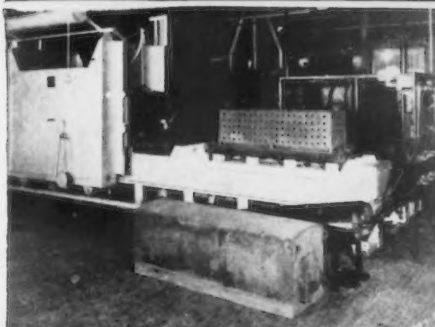
MOORE *RAPID* **Lectromelt FURNACES**

MOST RAPID and ECONOMICAL for MELTING and REFINING IRONS and STEELS

PITTSBURGH LECTROMELT FURNACE CORPORATION

Foot of 32nd Street, Pittsburgh, Pa.

We Build the Furnace To Fit Your Job



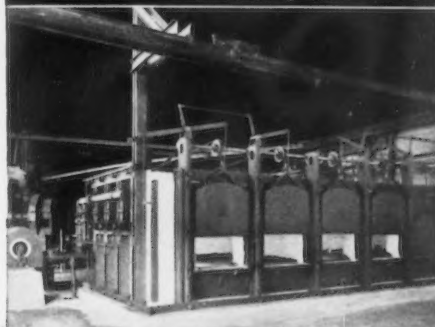
NITRIDING Batch and semi-continuous types for low-cost production nitriding



Bright Annealing Ferrous and non-ferrous clean - dry - continuous



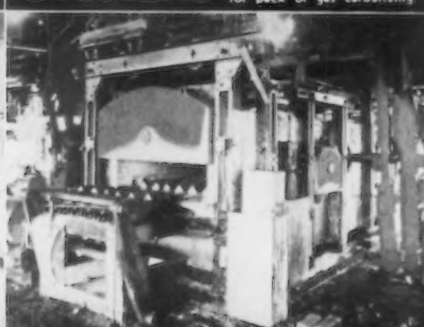
CARBURIZING Electric or fuel fired furnaces for pack or gas carburizing



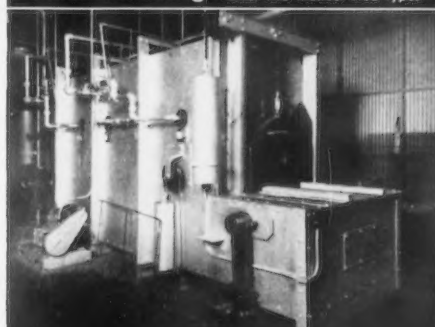
Billet Heating Oil and gas fired furnaces - direct and indirect fired types



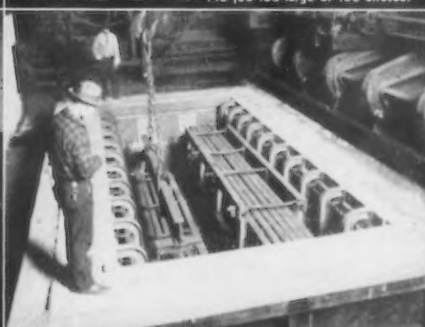
ANNEALING Oil stills up to 67 ft. in length. No job too large or too unusual



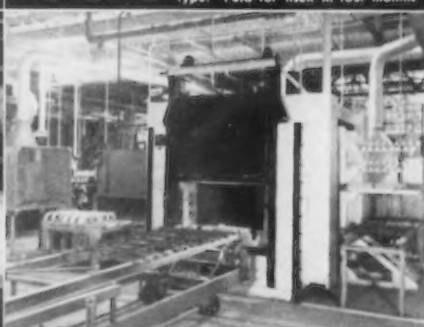
FORGING Continuous grooved hearth pusher type. Paid for itself in four months



HARDENING Chain belt furnaces for miscellaneous products - over 50 in use



Annealing Pits One dia battery of five in one plant. Anneal mill length bars



ENAMELING Furnaces in continuous and batch types - electric or fuel-fired



Heat Treating 32 hearth type furnaces - capacity 450,000 lbs. per day



Normalizing Gas fired rotary - normalizing 6000 lbs. 96" x 36" sheets per hr.



Heat Treating Structural shapes 90 feet long uniformly treated in this furnace

THE ELECTRIC FURNACE CO.

SALEM, OHIO.

Fuel Fired
Furnaces

Electric
Furnaces



ECONOMICAL CLEANING

★ Long experience has definitely proved that industrial cleaning includes many specialized jobs which can be economically handled only by specialized cleaners and cleansers.

★ That is why there is a complete family of Wyandotte Products — each one developed to do a certain type of work superlatively well. And that is why the Wyandotte sales force is a group of highly trained experts in cleaning problems.

★ You can safely rely upon the largest manufacturers of specialized cleaning materials in the world to give you really efficient and economical cleaning materials.

★ Write for detailed information.

THE J. B. FORD COMPANY

WYANDOTTE, MICHIGAN





STEPS

1. Correct, well-conditioned equipment, handling method, (hooks—crates—etc.) proper ventilation.

2. Control of pickle

TOWARD

bath as to time, temperature, acidity, proper inhibition and agitation.

3. Proper degreasing of articles to be pickled.

4. Elimination of hydrogen fumes, spray and steam.

5. Elimination of hydrogen embrittlement.

6. Acid economy—

BETTER

conservation of steam and water.

7. Proper rinsing of pickled material.

8. A GOOD PICKLING PRACTICE.

THESE are but a few of the many problems that constantly present themselves wherever pickling is done.

A good pickling practice coupled with a good inhibitor result in efficient, economical pickling.



PICKLING

Grasselli 3 (Powder) and Grasselli 8 (Liquid) are good inhibitors and are acknowledged to be among the leaders in the field. Let Grasselli Steel Service demonstrate the use of these Inhibitors in your pickling department. This service is maintained for the purpose of servicing our products and your problems. Its use in your plant assures you a definite step toward better pickling and lower costs. Let GRASSELLI be the answer to your pickling problems.

Write today for the interesting Inhibitor Booklet.

THE GRASSELLI CHEMICAL COMPANY
FOUNDED 1839 INCORPORATED CLEVELAND, OHIO

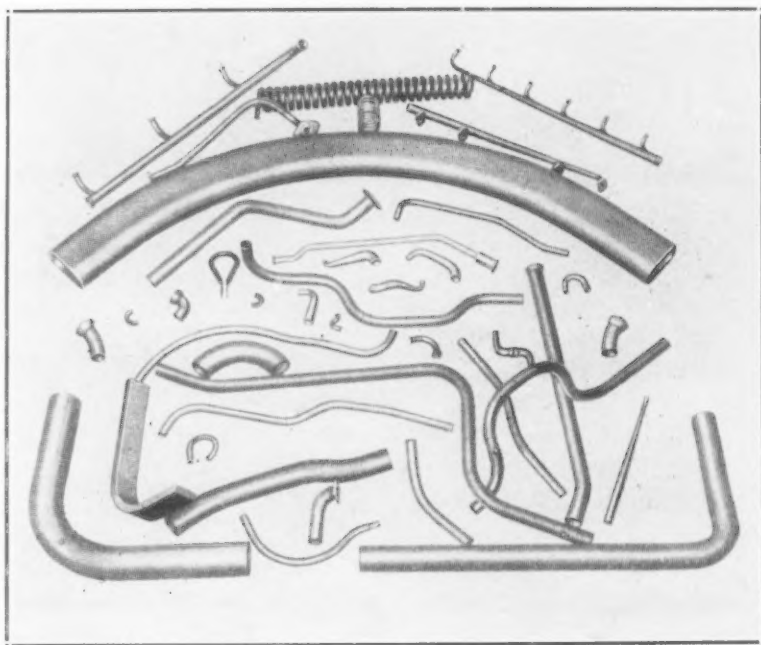


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GRASSELLI INHIBITORS**



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Forward

with **TAMCO**



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What better time to team up with TAMCO than now!

TAMCO produces a comprehensive list of TAM Alloys and Products for all needs of the practical metallurgist—TAM Alloys for “everything from locomotive tires to beer kegs”—rolled, cast and forged steels; cast iron; effervescing and killed steels; tires and rail steels; stainless and other steels; aluminum alloys and many other non-ferrous alloys. A TAM Engineer will be glad to discuss these or other types of TAM applications with you and your engineers.

TAM

FERRO CARBON TITANIUM

Producing in 1906 the first Ferro Carbon-Titanium (now known as TAM *Original F.C.T.*), TAMCO has since then developed another important ferro carbon-titanium, TAM *Low Carbon F.C.T.* Both are today helping produce superior steels, from the highest carbon down to the lowest carbon made.

TAM

MOLYBDENUM PRODUCTS

TAMCO now offers a line of molybdenum products and is in a position to assist you in selecting the correct molybdenum material for your type of work. Whether it is TAM Calcium Molybdate, TAM Ferro Molybdenum or TAM Roasted Concentrates, you can depend upon TAM Molybdenum Products.

OTHER

TAM PRODUCTS

TAM Products cover a range as broad as industry itself and include not only TAM Metallurgical Alloys for various grades of steels and cast iron, but also many alloys for non-ferrous work. In addition, TAM also offers a broad line of allied items such as fluxes, refractories, foundry facings and metallurgical chemicals.



Technical discussions (not sales talks!) of metallurgical problems have been appearing monthly in the "TAM Daily Reminder" since April 1933. The December 1934 issue gives a list of subjects. May we mail you a copy?

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TRUSCON
SETS
THE
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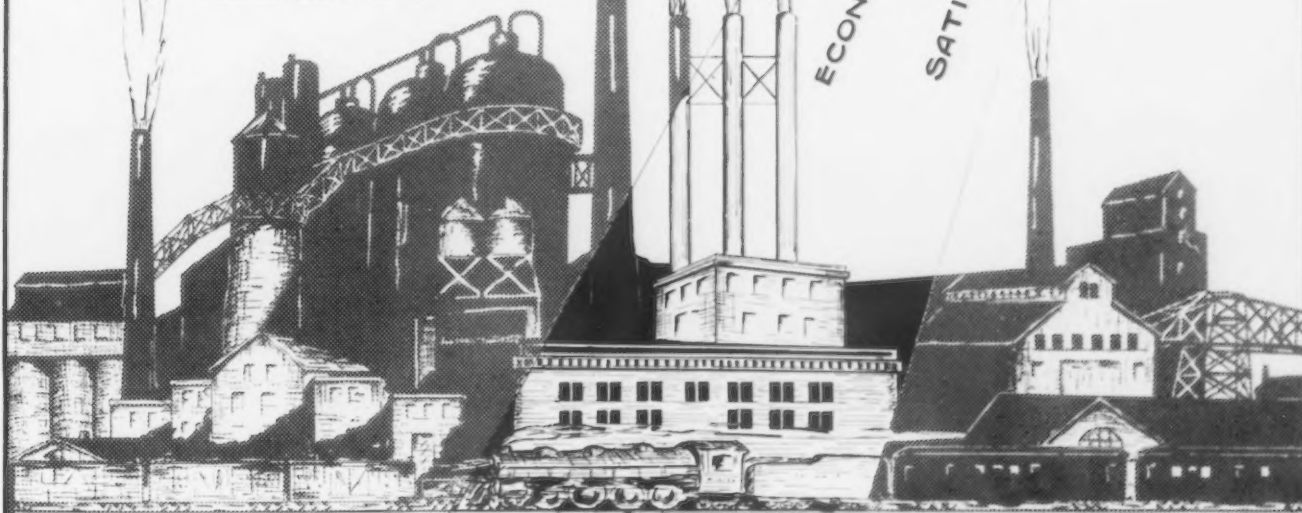
GLOBE FOREN-PROCESS

SEAMLESS STEEL BOILER TUBES

NO SEAMS
EXCESS-METAL
DANGER-OF-SPLITS
PLUG-MARKS
SCORES

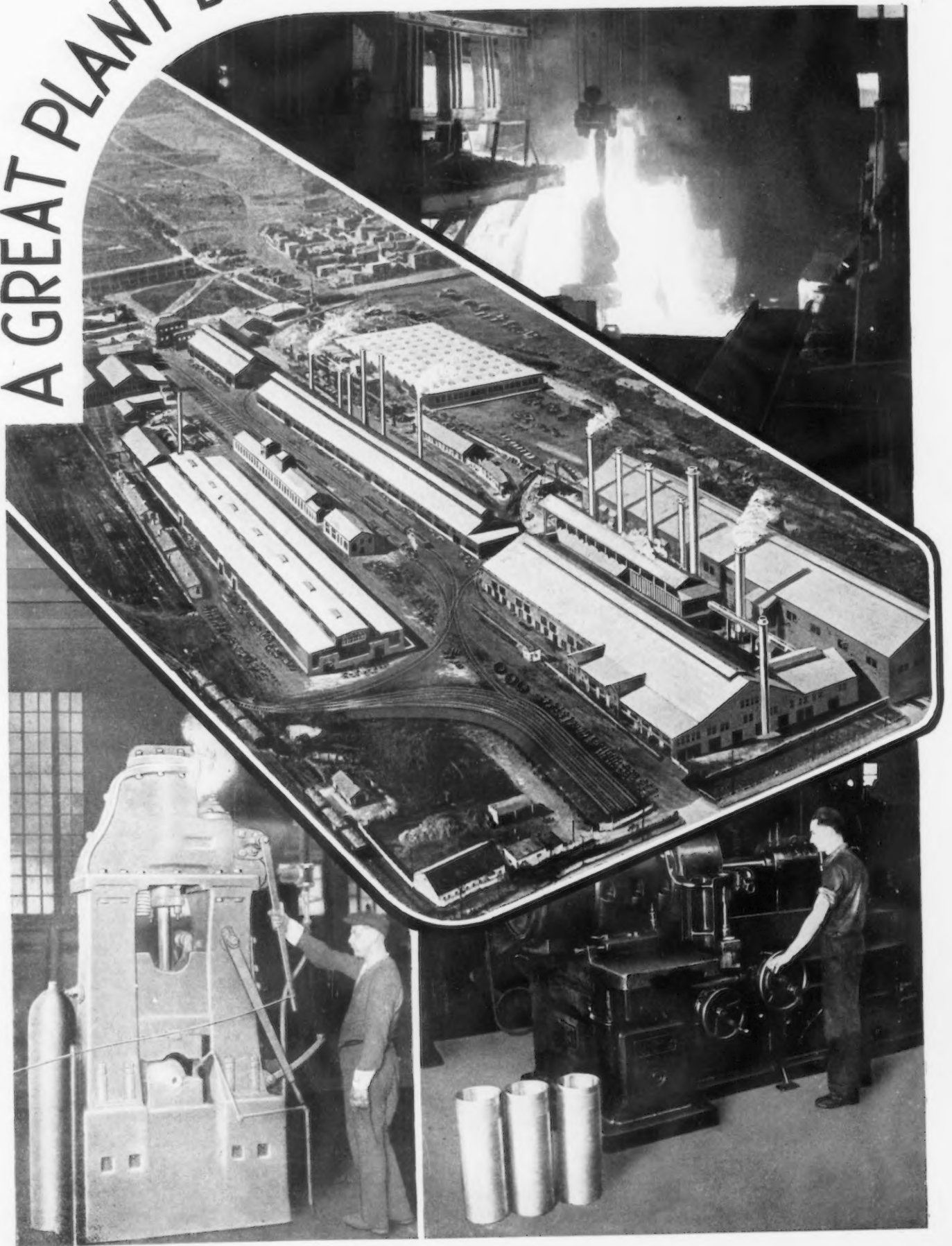
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GLOBE STEEL TUBES CO.
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OF LIGHT
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AND
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From ITS
**OWN QUALITY
STEELS.....**

Harrisburg products have a unique way of simultaneously appealing to both the purchasing and operating departments of its customers. For as a result of Harrisburg's unusually complete manufacturing facilities its products are not only of the highest technical excellence but are also competitive in price.

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Harrisburg operates its own open hearth furnaces, rolling mills, forge and machine shops. As a result the Engineering and Metallurgical Departments are able to co-operate to the extent that Harrisburg products are not only correct in design and processing methods, but that they are also made of steels with the physicals and analyses best suited to meet the metal requirements of each individual product.

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Three decades ago Harrisburg's pioneering activities marked it as a leader in the infant seamless steel industry. Since then Harrisburg has made notable contributions to this field such as the seamless steel pipe coupling; the



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Harrisburg is proud to be thus able to place a wealth of engineering experience at the disposal of its customers. Let us show you how our complete manufacturing control can effect notable economies in your purchases of to-order seamless and forged steel units as well as these standard products: carbon and alloy steel; drop and hollow forgings; drop forged steel pipe flanges; seamless steel high-pressure gas cylinders, couplings, pump liners, bull plugs; coils and bends.

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Harrisburg, Pennsylvania

NEW **UNBRAKO** NEW

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SOCKET HEAD CAP SCREW



Every mechanic, when driving screws, will invariably persevere with his fingers until he has to give up—but not before.

With the Knurled "Unbrako" he can drive much further and faster because his fingers actually become geared to the Knurled head and, therefore, can't slip, regardless of how greasy the head is.

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The Knurled "Unbrako" is of exactly the same high quality as the smooth head "Unbrako."

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Fingers become geared to the Knurled head so they can't slip, which makes the Knurled "Unbrako" a real time and labor saver.

Order by Name—
Specify the Knurled "Unbrako"
FREE SAMPLES



OLD SMOOTH-HEAD

Fingers slip and slide. Hard and slow to drive.

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IN ASSEMBLIES where speed is a factor, thread strength and thread accuracy of Cleveland Cap Screws made by the Kaufman Process is appreciated. These fine cap screws are full finished, and a Class 3 fit is standard. *Thirty million* cap screws, in a complete range of sizes, American Fine and Coarse threads, are stocked at our five warehouses and the factory for shipment *today*. Ask for Catalog D and

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Many manufacturers are now eliminating a number of special operations—saving time, simplifying their assembly, holding their assembly to greater uniformity, because they took up with Rathbone engineers the comparative costs of both ways. That is the basis of our success with other firms, and on this basis have we built a large business.

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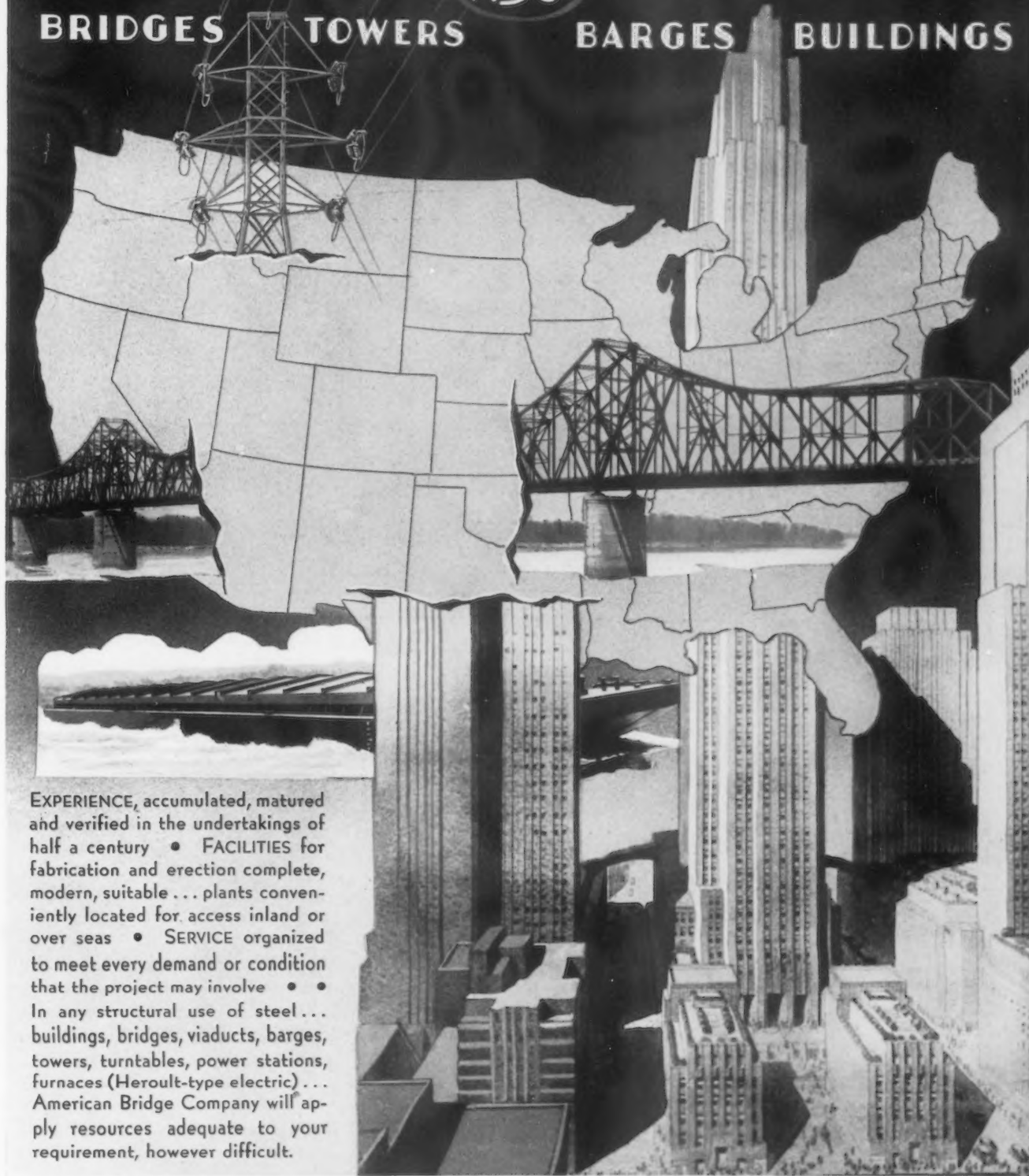
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We have supplied thousands of Ace hard rubber lined tanks that are successfully serving many and various industries. Our constant aim has been to perfect this lining so as to broaden its field of usefulness as protection against corrosion Research in this field has resulted in our new ACE M R-10 RUBBER TANK LINING. It has definite features and improvements that insure still longer life...and more economical service.

These are the REASONS WHY you may expect greater service and longer life from tanks lined with ACE M R-10 RUBBER TANK LINING:

- 1 SURFACE.** Glazed, smooth—impervious to corrosion. Easily cleaned.
- 2 RUBBER COMPOUND** Improved grade, pliable, non-permeable. Considerably better acid-resistance.
- 3 INNER LAYER** between steel and rubber lining is high tensile soft rubber. Equalizes expansion and contraction. Cushions outer rubber lining.
- 4 BOND** of inner layer of soft rubber to outer rubber lining and to steel tank is stronger than ever.
- 5 TECHNIQUE.** improved to include heavy, soft rubber fillets beneath the lining in all corners of the tank.

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PRICES, ETC.
ON REQUEST

Results have been checked by laboratory test...and proved in service. You might expect the new ACE MR-10 RUBBER TANK LINING to cost more because of these advantages. It doesn't. The price has not been increased.

AMERICAN HARD RUBBER CO., 11 Mercer St., New York, N. Y.
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Now is the time to investigate and specify

...ACE M R-10...THE NEW RUBBER TANK LINING



Reflected light in photograph shows high surface gloss

ACE M R-10 RUBBER TANK LINING

THE IRON AGE, January 3, 1935—437

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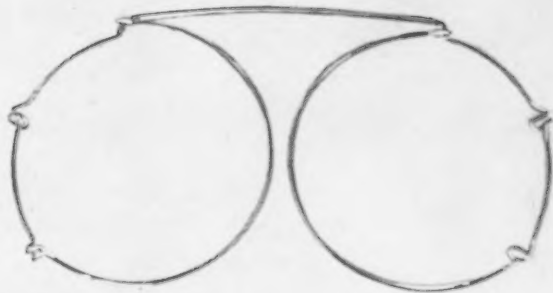
Wire for Practically All Purposes and Requirements
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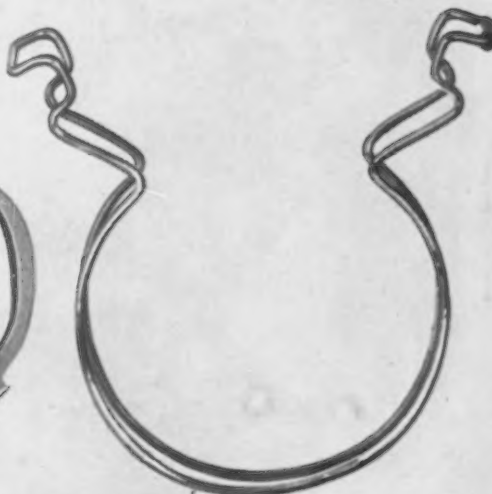
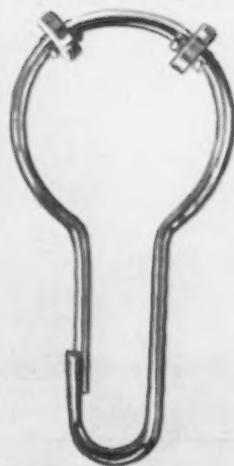
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Universally Recognized As The Standard of Quality

We believe that steel production troubles should be borne by the maker
—*not* the user.

We put this belief into practice by careful inspection at each stage of
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test that is rigid and thorough.

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You could buy a New Machine
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IT TAKES a lot of money to pay for an injured eye. Compensation *alone* may exceed \$2,000—in addition to lost time, medical and hospital expenses—enough in most cases to buy a new piece of production equipment.

Yet almost every eye injury—and there are more than 300,000 of them every year—*maybe prevented by the right goggles.* American Optical Company offers a wide selection of goggle equipment accurately fitted to the needs of the man and his job. They are strong, cool—and so comfortable that men accept and *wear* them as an aid to more efficient work.

An AO branch office is located in every principal industrial center in the United States. Get in touch with the one nearest you and have an AO Industrial representative call. He will be glad to work with you in developing a practical—and highly profitable—eye-safety program. Call him today.



PATENTED
The AO DURALITE "50" is light, cool, comfortable. Its fuss-proof bridge provides easy *permanent* adjustment to any face. Super Armorplate lenses provide maximum resistance to impact.

American Optical Company

Manufacturers, for more than 100 years, of products to aid and preserve vision. Factories at Southbridge, Mass. In Canada, Consolidated Optical Co., Ltd. Branch offices in all principal industrial centers

1407

THE IRON AGE, January 3, 1935—441

BUDD CAN SAVE YOU MONEY ON PRESSED STEEL PARTS

Because of our wide production facilities for steel stampings, we are in an excellent position to save the manufacturer money on pressed steel parts of all kinds. Our machine shop is the best equipped on the Atlantic seaboard—for both large and small dies. We have helped hundreds of manufacturers lower production costs on blanks and stamp-

ings, in both regular-grade and stainless steel. We have quantities of steel in stock, in gauges from No. 11 to No. 22.

Let us quote you a price. Send us a blueprint, pencil sketch, or sample of your product, stating the quantity you need. We undoubtedly have the answer to your production problem.

EDW. G. BUDD MANUFACTURING COMPANY
PHILADELPHIA, PENNA.

METAL STAMPINGS



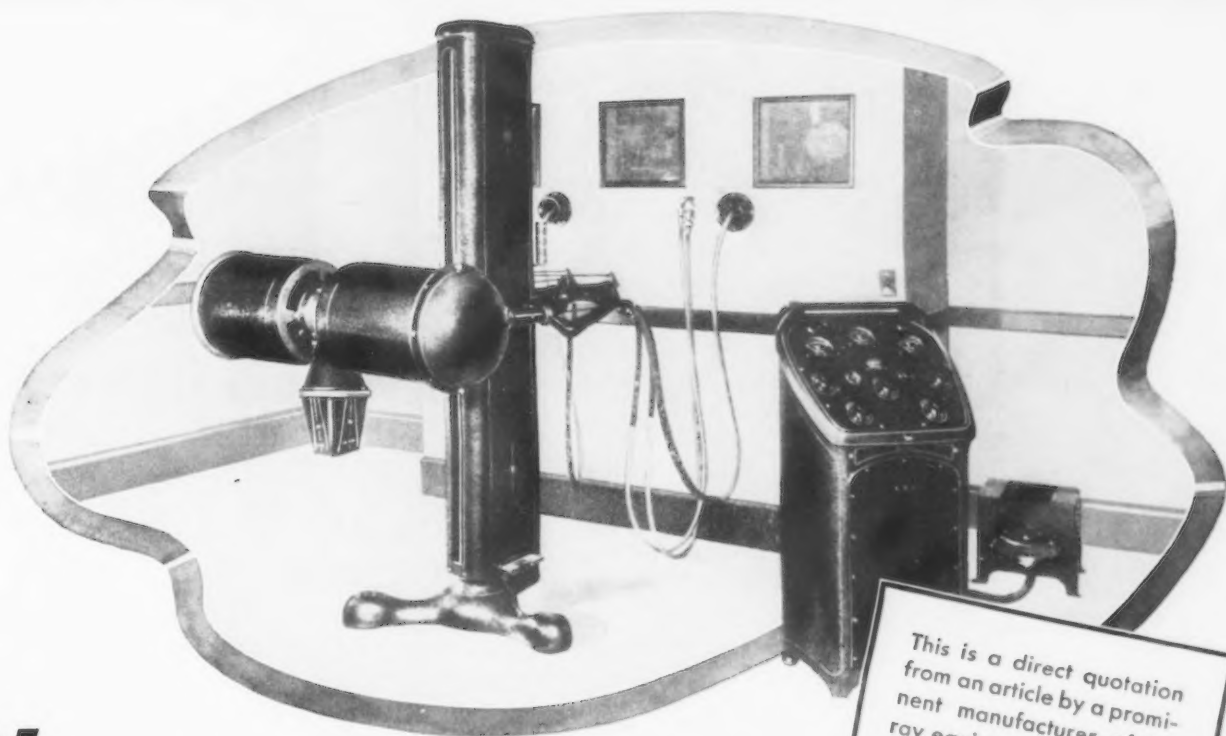
Since 1896 the Crosby plant has been devoted, exclusively, to designing and producing Sheet Metal Stampings. Avail yourself of this experience. Send us your next stamping problem and watch results.

Manufacturers of "IDEAL" TROLLEY WHEELS

THE CROSBY COMPANY

General Offices and Works: BUFFALO, NEW YORK

Branch Offices: Chicago Detroit Cleveland New York Philadelphia Pittsburgh



X-RAY EQUIPMENT

protected by

PARKER PROCESS

This is a direct quotation from an article by a prominent manufacturer of X-ray equipment, explaining why they use Parkerizing:

"... When plating was used, it stretched, blistered and peeled off, exposing the underlying metal, which usually rusted... For many years, we have been using Parkerizing. Because of this, these units are in good condition after many years of usage."

WHEREVER fine equipment requires especially effective rust prevention, Parkerizing is found to be highly efficient.

It is not only highly resistant to corrosion, but provides a substantial final finish of itself. Its matte black color harmonizes with many mechanical assemblies.

Parkerizing is easily applied in bulk and is especially adapted to finishing deeply recessed or threaded articles. A uniform coating is developed wherever the solution can penetrate.

It is applied without the use of complicated equipment.

PARKER RUST-PROOF COMPANY • 2186 EAST MILWAUKEE AVENUE • DETROIT, MICHIGAN



The Parker Processes are the result of more than 19 years of research in scientific metal protection. Literature describing these processes will be sent, upon request, to interested manufacturers and technical men.

PARKER

RUST-PROOFING

processes

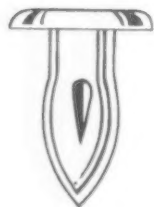
BONDERIZING • PARKERIZING



GROOV-PINS!



6 to 8 Times More Shake-Proof



THE automobile is perhaps the best "proving ground" to test a fastening which is subjected to vibration.

Groov-Pins are used in automobile construction to anchor springs, to key gears, to fasten the pedal shaft assembly and for dozens of other purposes. Service in automobiles substantiates tests made in laboratories that Groov-Pins hold tight.

If a solid taper pin is dislodged even a small fraction of an inch, it falls out. A Groov-Pin may be forced as much as half an inch out of place and still retain its high holding power.

Just drill a hole, and drive in a Groov-Pin—that's all there is to it. It's quick, simple and requires no reaming.

Groov-Pins are used by hundreds of manufacturers of machinery and other assembled devices. They may be used over and over again. Made in many types and of many metals.

It is quite probable that your assembly problems could be better solved with Groov-Pins. Our engineers are at your service without obligation.

GROOV-PIN CORPORATION
47-18 37th. St. Long Island City, N.Y.



Ever
Try to Erase
with a Piece of
Raw Rubber?

■ ■

It smears. An imperceptible salting of grit is necessary to dig in—do the job. It's the same with a manufacturing policy. To dig under the surface takes extra quality . . . so rare that only a few manufacturers have it . . . *manufacturing sand that bites in and gets results.*

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Deliver Satisfactory Manufacturing Results

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MURRAY IRON WORKS COMPANY

(Incorporated 1870)

BURLINGTON, IOWA

POWER PLANT EQUIPMENT

BOILERS, ENGINES, GENERATORS, TURBINES,
TURBO-GENERATORS, GEARS

*Please send us a statement of your requirements
and ask for quotations.*

ALL KINDS OF CONTACTS ARE

MADE THROUGH THE

Classified Sections

The classified sections of The Iron Age are a frequent means of contact for all kinds of services. ¶ Somebody wants to locate a company to make certain parts or machines for him, and turns to the Contract Manufacturing Section. ¶ Somebody else is looking for a bargain in used equipment and turns to the Clearing House Section. ¶ Another is watching for Business Opportunities, and keeps his eye on that section. ¶ Then, of course, there is the active Employment Section where men and positions get together. ¶ See the pages following the Products Index.

FOR YOUR MALLEABLE CASTINGS REQUIREMENTS!

For over thirty years American Malleable castings have been known for their exceptional quality, great tensile strength, predominating durability, necessary ductility, extreme toughness, perfect uniformity—insuring ideal machining qualities, absolute dependability with no flaws or structural weakness—also for the unexcelled service which the organization back of them strives earnestly to give.

Service and satisfaction are the bedrock foundations of American Malleables. Unequalled railway facilities (N. Y. C., Erie, Pennsylvania, Chesapeake & Ohio) and exceptional truck service make it possible to insure prompt deliveries.

Write us for estimates on your malleable requirements—no obligation.

THE AMERICAN MALLEABLE CASTINGS COMPANY
MARION P.O. BOX 14 OHIO

AMERICAN MALLEABLE CASTINGS

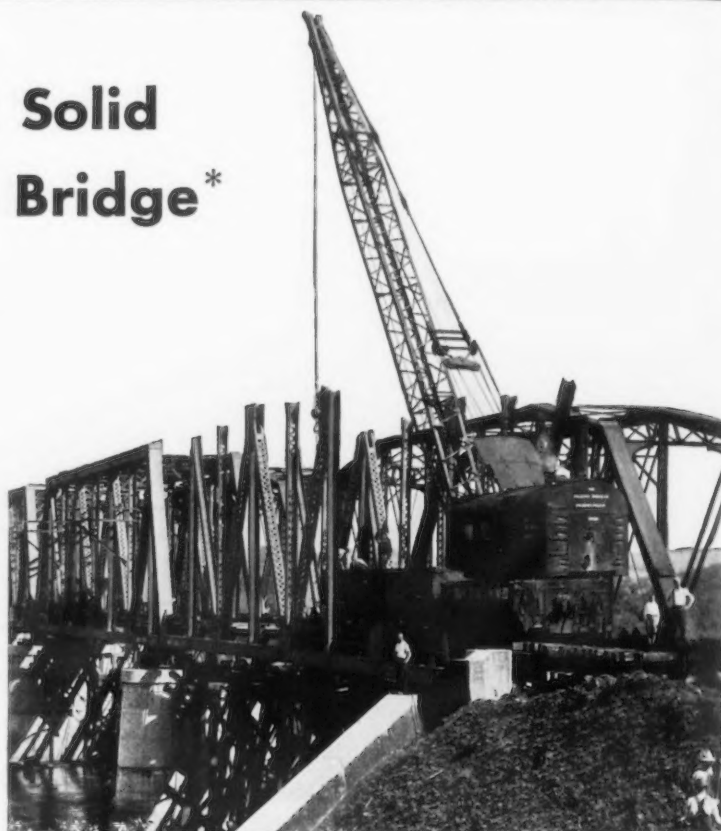


ON THE First Solid Steel-Deck Railroad Bridge*

The new nine-span bridge superstructure, built for the Susquehanna River crossing of the Reading Company, marks the first use of a solid steel deck on a railroad bridge.

The Phoenix Bridge Co., in erecting this superstructure, used two Industrial Brownhoist cranes; one of 60, the other of 50 tons capacity. Commenting on their cranes, this company says, "We have used Industrial Brownhoists since 1916 and our experience with them has been very satisfactory. The cost of maintenance has been very reasonable, considering the heavy work required of them."

* Described in November 22nd issue of Engineering News Record.



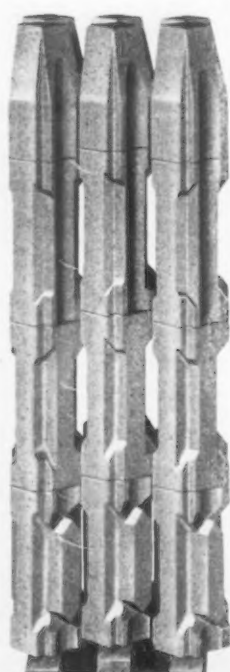
GENERAL OFFICES:
BAY CITY, MICHIGAN

INDUSTRIAL BROWNHOIST

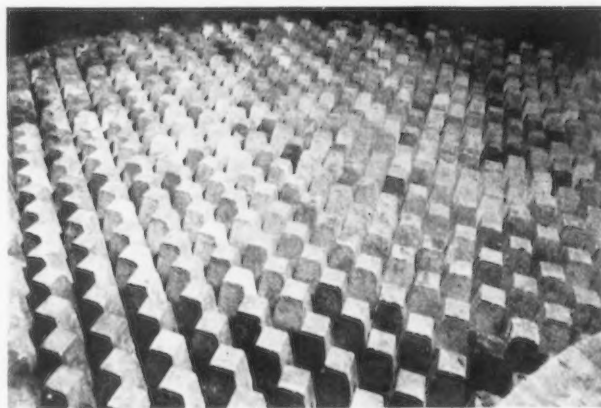
NEW YORK, PHILADELPHIA,
CLEVELAND, CHICAGO

The AMERICAN OPEN JOINT CHECKER

is of ideal design to obtain maximum weight and heating surface in each section of a Blast Furnace Hot Blast Stove as required by the varying temperature and volume of the gases.



Note the structural strength of this brick shape—a solid brick, but with 92% of the surface open to gases and with sufficient thickness behind all surfaces to provide maximum heat storage capacity.



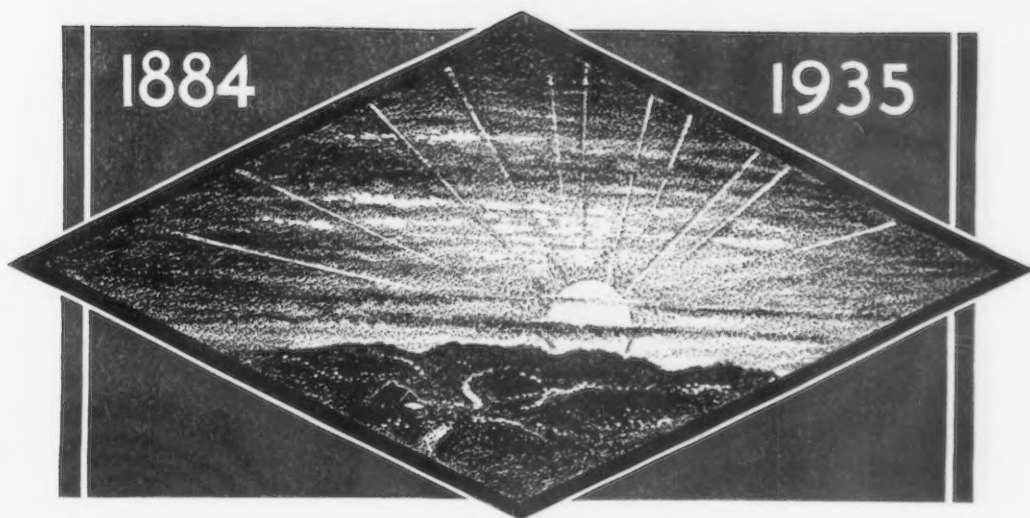
View of Inlet Checkers

This Inlet design, by reason of its 60% free area, procures distribution of gas to all flues at top of checker chamber and is of proper shape and sufficient weight to withstand high temperatures existing at this point. Heat storage capacity is of special advantage in the top section of a stove.

WILLIAM M. BAILEY COMPANY
MAGEE BUILDING ENGINEERS PITTSBURGH, PA.

1884

1935



HALF A CENTURY

*...since the dawn
of a New Era!*

With the advent, fifty years ago, of the present Zapon Company, came a revolutionizing change in methods of commercial finishing.

Then, for the first time, there became available, through Zapon Pyroxylin Lacquers, an entirely new method of surface protection, which proved highly economical of time and money, while emphatically improving beauty of finish.

This was indeed the dawn of a new era...the era of beauty and utility, rather than utility alone.

You are invited to take advantage
of the complete laboratory facilities
in Stamford and North Chicago.

Eastern Sales

THE ZAPON COMPANY

A Subsidiary of Atlas
Powder Company

STAMFORD, CONN.

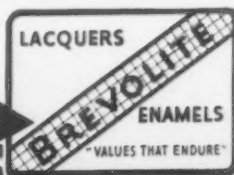


Western Sales

ZAPON-BREVOLITE

LACQUER COMPANY

NO. CHICAGO, ILLINOIS



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Instruments, Musical
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Electrical Goods
Paper & Paper Novelties
Radio & Radio Parts
Silverware
Sporting Goods
Wood Products
Wood & Metal Furniture
Toys
and many others

LACQUERS

JUST BETWEEN US TWO

Here It Is

AS this is written no one has seen a completed copy of this issue, the Annual Number. We haven't even seen a dress rehearsal, but enough has met our eyes to fill us with awe.

Here, we suspect, is a publishing miracle, a prodigious leap ahead, a mistily distant mark for ourselves and others to shoot at for a long, long time.

We genuflect to the men who made it.

We Count Our Medals and Bruises

THE year was kind to your favorite trade paper. For every 100 readers it had the last day of '33, 110 were present at the end of '34. Advertisers, too, were kind, increasing the volume of space close to one-third for the year.

Bouquets, always a good barometer of trade opinion, darkened the sun at pleasingly frequent intervals. And there were enough cabbages mixed in to keep us humble.

While we believe that anyone who prophesies in these uncertain times unnecessarily exposes his knuckles to sharp and painful cracks, the fact that December brought in more new business than any other month in three years causes us to view '35 in the Dizzy Dean rather than the Babe Ruth manner.

Now, in a Low Voice

IN a small way this column, too, has much to be thankful for. We started '34 with only 12 certified readers. By the end of the year the "Just-Between-Us-Two-ers" had grown to the astonishing total of 14, none of whom is, we are proud to say, Mrs. Harold McKee, of Round Grove, Ill., who recently established a new world's record by yawning continually for nine years.

Our fan mail is still something less than Father Coughlin's, but the 100 per cent increase from two letters in '33 to four in '34 is not to be sneered at.

"Oh, How I Hate to Get Up..."

OUR knowledge of political economy is so slight that we cannot say whether or not, under a given set of conditions, dictatorship is avoidable.

We would, however, dislike very much to live in a country so governed, for it seems that wherever you have dictatorship you also have hysterical patriotism of the type common in most countries during wartime. You may recall that even in this land of relative tolerance sauerkraut was foolishly called "liberty cabbage" during the war; it wasn't good form to refer to a certain alloy as "German silver," and even the word kindergarten was suspect.

The latest evidence of the silly lack of balance that seems to be the inevitable concomitant of dictatorship comes from the Fatherland. Time clocks, it seems, are undignified. The Nazi trade union commissioner says that a military muster in factory courtyards must replace dial-punching.

We wonder what will be running through the mind of Hans Schmidt, tool maker, who has made a life-long habit of getting to work ten minutes ahead of time, when he is obliged to hang around the factory yard for ten minutes some cold and stormy morning, waiting for reveille to blow.

For Ever and Ever

STILL, Germany is kinder to some of her old gods than we are. We see that a Middle Western city has changed the name of Woodrow Wilson Boulevard to Blue Bell Boulevard, while the Kaiser William Institut, Dusseldorf, an old IRON AGE subscriber, remains, under Nazi rule, the Kaiser Wilhelm Institut.

Rebuke

IN a circular letter sent out recently we referred to THE IRON AGE modestly as "the bible of the industry." An anonymous recipient returned the letter with the word "bible" encircled, and added, "Ignorant advertisement or insinuation on manhood," graciously permitting us to take our choice.

We are abashed and humbly ask our critic for a substitute.

Get This Thing Settled

WE are in the confused state of mind of the child who sees two Santa Clauses in the same block over two advertisements right next to each other on page 586 of the New York City classified telephone directory. Philip Sievering, Inc., heads its ad, "Largest Plating Plant in the U.S." The Tillman Electro Plating Works, Inc., heads its ad, "Largest Plating Plant in the U.S."

Come, come, gentlemen, why not match for it?—A.H.D.



Just Pick 'Em Out—

Over 500 different sizes of completely machined and finished—ready for assembly—bronze bushings and bearings are constantly carried in stock for your convenient use. They fit practically every application. Small lots at big run prices. Ask for list.

Nothing Unlucky About This—

13-inch Phosphor Bronze cored and solid bars permit the machinist to economically cut multiples of standard bearing lengths without excessive waste. Ample stock on O. D. to allow finishing to size stamped on the bar. All bars are machined and centered. 116 sizes. Ask for list.

Babbitt As You Like It—

Bunting Babbitt establishes the minimum coefficient of friction in the industry. Non-adhesive, close grain. Absolute uniformity. Assures practically oil-less operation. The kind of Babbitt you would expect of Bunting. You can get Bunting bearing metals from leading mill supply wholesalers everywhere.

Made-to-Blueprint

This plant is in continuous big production of bronze bushings and bearings made to customer's specifications. Free use of patterns and tools for over 30,000 different designs. Engineering and metallurgical counsel without cost or obligation.

THE BUNTING BRASS & BRONZE COMPANY, TOLEDO, OHIO
Branches and Warehouses in All Principal Cities

BUNTING  **Quality**
BRONZE BUSHINGS • BEARINGS
MACHINED AND CENTERED BRONZE BARS
ANTI-FRICTION METAL

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Socket Head Cap Screws



No need to worry about MAC-IT SCREWS. Their Xtra strength insures trouble-free performance. . . . And remember, when specifying socket head cap screws for die work, the Xtra strength is incorporated in *Mac-it Screws*.

*"The World's
Strongest Screw"*

The Strong, Carlisle & Hammond Co.

NATIONAL DISTRIBUTORS

1392 West Third St., Cleveland Ohio



NAILS RIVETS

WOOD AND MACHINE SCREWS

AND OTHER
HEADED PRODUCTS

MADE FROM
18% CHROMIUM 8% NICKEL

*A Chromium-Nickel Steel which resists
corrosion by Acids, Air or Salt Water*

MANUFACTURED BY

JOHN HASSALL, Inc. Clay and Oakland Sts.
Brooklyn, N. Y., U.S.A.
Established 1850



PARKER

ERIE DIE CASTINGS



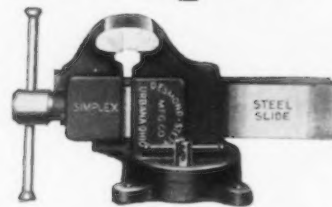
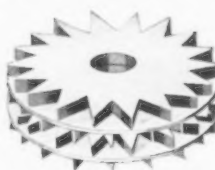
Specializing in zinc base die castings from ALL of the modern alloys possessing great accuracy and stability for Precision work. Produced on our automatic machinery at high pressure, producing a very dense and perfect casting at high speed.

Send us your prints or models for quotations, which you will find very interesting
PARKER WHITE METAL & MACHINE COMPANY
 ERIE, PA.

Grinding Wheel Dressers and Cutters — Machinists' Vises



Nos. 0, 1, and 2 Desmond Huntington Dressers



SIMPLEX STEEL SLIDE VISES

We manufacture a complete line of grinding wheel dressers and cutters and vises. Write to-day for your copy of our complete catalog and name of your nearest distributor.

THE DESMOND-STEPHAN MFG. CO.—URBANA, OHIO

Canadian Desmond-Stephan Mfg. Co., Ltd., Hamilton, Ont.

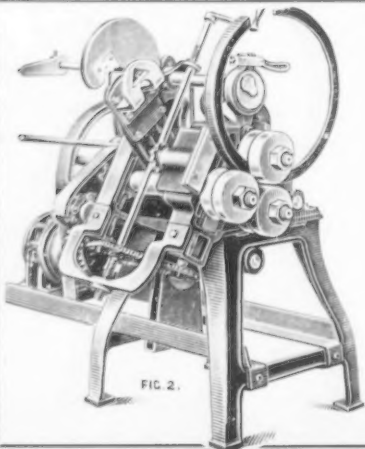


FIG. 2.

No. 14-EXCELSIOR-No. 13 BENDING MACHINES

Angle, Channel, Flat, Round or Square Iron

No. 14
 Circular Bent Angles
 Capacity 2" x 1/4"
 True Circles, all the
 Rolls Direct Driven

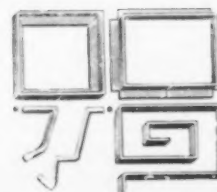
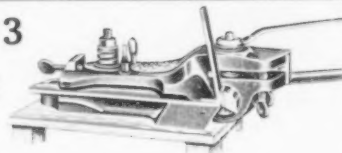
No. 13
 Square Bent Sizes
 1 1/2" x 1/4" Capacity
 2 1/2" x 3/16" Capacity
 4" x 1/8" Capacity

*Manufacturers of
 Shearing, Punching, Grinding and Polishing Machines.*

Write for descriptive circulars.

EXCELSIOR TOOL & MACHINE CO.

EAST ST. LOUIS, ILLINOIS



Perforated Metals—Mitco Open Steel Flooring—Steel Plate Construction

At the start of the new year may we remind you that Hendrick is ideally equipped to supply your requirements for

Perforated Metals—standard or special perforations; in steel, bronze, brass, aluminum, Monel and stainless steel; also perforations in rubber, fibre and other materials.

Double Corrugated Plate—"Sground"® Mesh, Flanged Lip Screens and other Hendrick specialties.

Perforated Metal Grilles in standard and special designs.

**Registered, U. S. Patent Office*

Elevator Buckets, hoppers, chutes, casings, machine guards, stacks—in fact, practically anything fabricated from plates and sheets.

Mitco Open Steel Flooring and Mitco Shur-Site Treads—sturdy, rigid, 90% open area.

Mitco Armorgrids for reinforcing concrete and composition floors.

The Hendrick line is a large one. Write for Perforated Metals Handbook, Grille Book and the new booklet "Mitco Products".

HENDRICK MANUFACTURING CO.

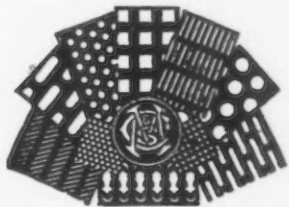
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MUNDT PERFORATED METALS

Large stocks of all metals always in hand ready to punch for any arrangement of perforations.

Sixty-one years of manufacturing perforated metals for every conceivable purpose assures satisfaction.

Write for Catalog of Patterns.



TIN, STEEL, COPPER, ALUMINUM, BRONZE, BRASS, ZINC, ANY METAL, ANY PURPOSE

CHARLES MUNDT & SONS
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Cone 4-Spindle Automatics

Are economical and accurate producers of screw machine parts up to 6" diameter, 7" milling length. They cut costs, increase production, boost profits.

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Indiana: G. A. Richey, Chamber of Commerce Bldg., Indianapolis, Ind.
New York State: Syracuse Supply Co., Syracuse, N. Y.; also Rochester, N. Y.
Pennsylvania: Arch Machinery Co., 1005 Park Bldg., Pittsburgh, Pa.
Philadelphia: Lloyd & Arms, Inc., 132 South 36th St., Philadelphia, Pa.
California: C. F. Bulotti Machinery Co., 829-831 Folsom St., San Francisco, Calif.

LELAND-GIFFORD COMPANY

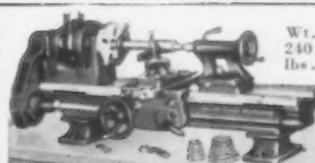
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Belt and Motor Spindle

One to Six Spindles

Tapping Attachments and Multiple Heads



9" x 3' Back-Geared, Screw Cutting \$75
"Workshop" Bench Lathe

SOUTH BEND LATHES

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South Bend Lathe Works
324 E. Madison St.,
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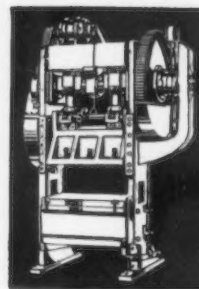
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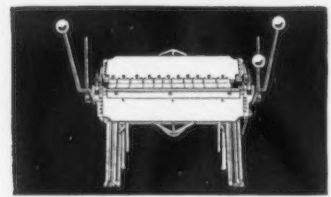
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ABRASIVE SURFACE GRINDER

Either Horizontal or
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Type
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AUTOMATIC THREADING MACHINES
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PRODUCTION POLISHERS

Centerless feed machines for cylindrical work,
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If it's RIVETED you KNOW it's safe

Cutting-Off Machines

—for thin and thick wall steel tubing and bars

BARDONS & OLIVER

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We also manufacture a large line of turret machinery for finishing cast iron, steel and brass



Robinson Sheet Metal Working Machinery

Inclinable Presses Gap Presses
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NEW ALBANY MACHINE MFG. CO.
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Emery Wheel Dressers

Two Sizes

CUTTERS

Nos. 1-2

We make the regular Huntington (Pattern) for all sizes,
Roughing for Nos. 1 and 2. Paragon for No. 1 only.

GEO. H. CALDER CO., Lancaster, Pa., U.S.A.



Cutting Off
Machines for
Sawing All Kinds
of Metals

THE ESPEN-LUCAS MACHINE WORKS
FRONT AND GIRARD AVE. PHILADELPHIA, PENNA.

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Makers of High Grade Tempered and Polished Steel for Clock, Watch, Motor and Typewriter Springs. Also Wound Springs. Tempered and Untempered Steel for other purposes. Special quality equal to finest imported for finish and accurate rolling. Also Stainless Steels of various grades.

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CARBON AND ALLOY TOOL AND DIE STEEL
SWEDISH (Norway) IRON SOLID STEEL ANVILS

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HIGH SPEED and CARBON TOOL STEELS
LATROBE ELECTRIC STEEL CO. LATROBE, PA.

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Manufacturers of Genuine Wrought Iron Products

Staybolt Iron—solid and hollow rolled

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Iron Rivets and Rivet Iron

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"BURDEN BEST" Wrought Iron

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Write for free new booklet—

"Only Paralan Can Do All That Paralan Does"

BETTER protective coating. It makes steel sheet, strip or wire, easier to clean, stack and handle. Reduces car bracings. Satisfies old customers and makes new ones.

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THE AMERICAN TUBE AND STAMPING PLANT
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Hot and Cold Rolled Strip Steel

Representatives: American Rolling Mill Co. of Calif., San Francisco

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The Stanley Works, 100 Lafayette St., New York City
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COLD ROLLED
STRIP
STEEL

1/2" to 19" wide.

.002" to .500" thick

Desired Quality for Forming and Drawing

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Santa Barbara Drive.
CLEVELAND—Paterson-Leitch
Company, 900 E. 69th Street.
BUFFALO—J. J. Lambert, 323
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Made for Cutting Box Strapping,
Steel Wire, Electric Cable, Chain,
Bolts and Staybolts.

Also Hand-Operated Sheet Metal Buttoners
for Ventilation Ducts.

Sizes for Every Need.

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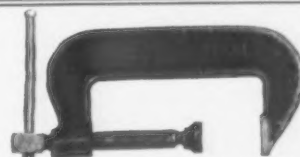
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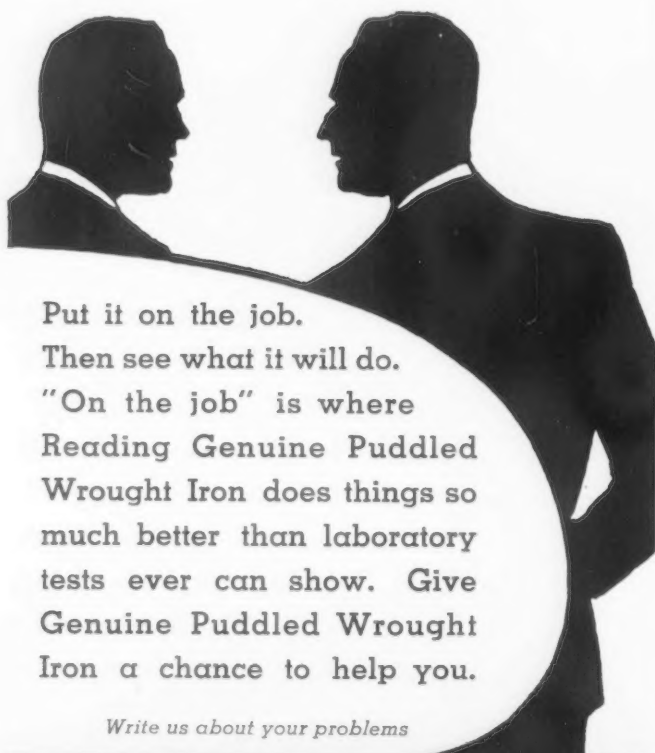


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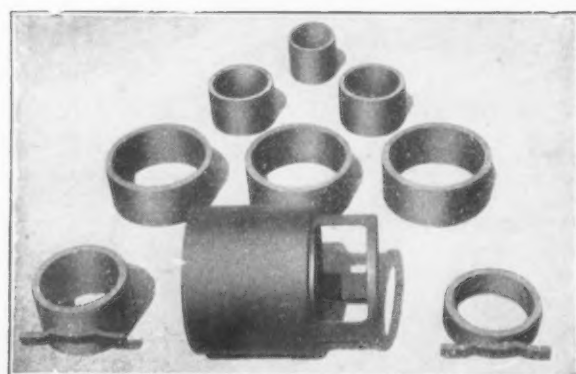


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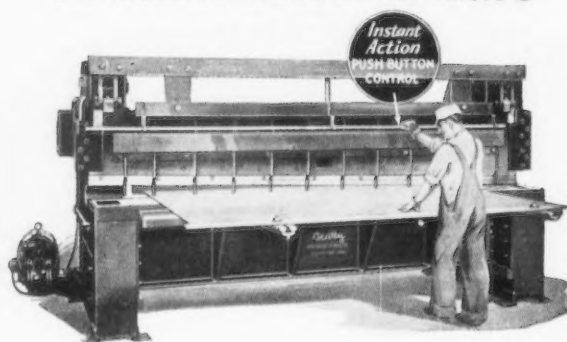
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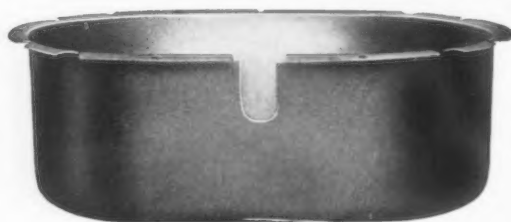


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Seymour (Conn.) Mfg. Co.
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Beatty Mch. & Mfg. Co., 936-15th St., Hammond, Ind.
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Johnson Bronze Co., New Castle, Pa.
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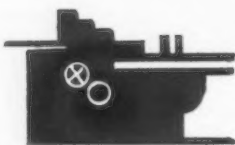
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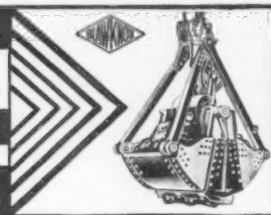
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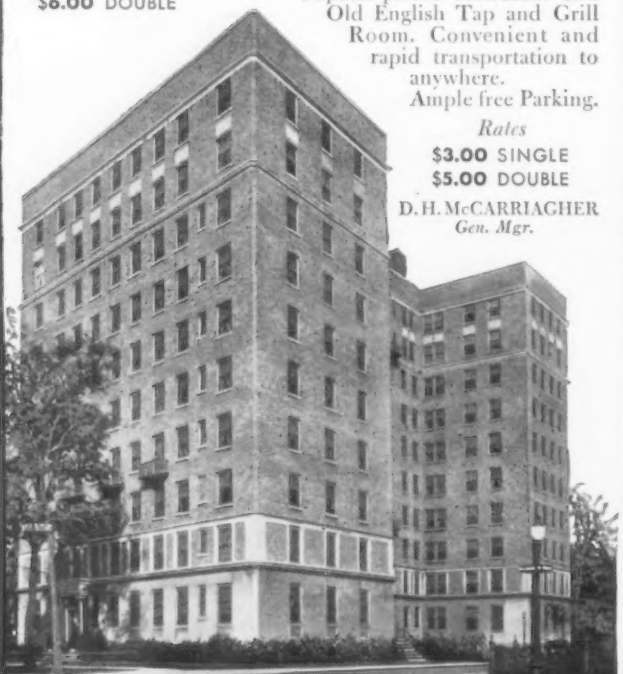
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- Metal & Thernit Corp., 120 B'way, N. Y. C.**
- FERRO ALLOYS—Vanadium**
Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C.
- Metal & Thernit Corp., 120 B'way, N. Y. C.**
- Vanadium Corp. of America, 120 Broadway, N. Y. C.**
- FERRO ALLOYS—Zirconium**
Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C.
- FILES & RASPS**
Atkins, E. C. & Co., Indianapolis, Ind.
- Disston, Henry & Sons, Inc., Philadelphia**
- FILTERS—Pressure or Gravity**
Scaife, Wm. B., & Sons Co., Pittsburgh
- FIRE BRICK—Insulating**
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.
- Massillon (Ohio) Refractories Co.**
- FIRE CLAY**
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- Illinois Clay Products Co., Joliet, Ill.**
- Massillon (Ohio) Refractories Co.**
- FITTINGS—Brass, Pipe and Tube**
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- FITTINGS, CAST IRON—Rubber Lined**
American Hard Rubber Co., 11 Mercer St., N. Y. C.
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Harrisburg (Pa.) Pipe & Pipe Bending Co.
- Taylor Forge & Pipe Works, Chicago.**
- FLANGES—Upset Forged**
American Forge Co., 2621 S. Hoyne Ave., Chicago.
- FLANGING WORK—Carbon and Alloy**
Lukens Steel Co., Coatesville, Pa.
- Worth Steel Co., Claymont, Del.**
- FLEXIBLE SHAFT EQUIPMENT**
Strand, N. A. & Co., Chicago.
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Linde Air Prods. Co., The, 30 East 42nd St., N. Y. C.
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Nukem Products Corp., 68 Niagara St., Buffalo.
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- Hendrick Mfg. Co., Carbondale, Pa.**
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- National Mchry. Co., Tiffin, Ohio.**
- FORGINGS—Alloy Steel**
American Forge Co., 2621 S. Hoyne Ave., Chicago.
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- FORGINGS—Brass, Bronze or Copper**
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- Commonwealth Brass Corp., Detroit.**
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- Canton (Ohio) Drop Forging & Mfg. Co.**
- Clapp, E. D., Mfg. Co., 86 Columbus Ave., Auburn, N. Y.**
- Oliver Iron & Steel Corp., Pittsburgh.**
- Rockford (Ill.) Drop Forge Co.**
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Dow Chemical Co., Midland, Mich.
- FORGINGS—Upset**
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- Bethlehem (Pa.) Steel Company.**
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- FURNACES—Electric, Steel Melting**
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Holcroft & Co., Detroit.
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- FURNACES—Heat Treating, Electric**
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Haines Gage Co., The, Phila., Pa.

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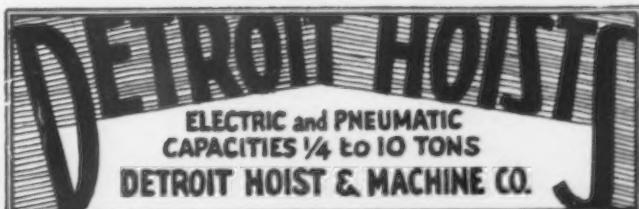
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Phosphor Bronze Smelting Co., Phila.

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St. Joseph Lead Co., 250 Park Ave., N. Y. C.

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LOCOMOTIVES—Industrial

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LOCOMOTIVES—Storage Battery

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Eastern Mchry. Co., 3263 Spring Grove Ave., Cincinnati, O.

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Hill-Clarke Mchry. Co., 617 W. Washington Blvd., Chicago.
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Lucas, J. L. & Son, Inc., Bridgeport, Conn.
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Ritterbach & Co., Inc., 30 Church St., N. Y. C.
Riverside Machinery Dept., Detroit.
Robinson, Harry A., Philadelphia.

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Sun Mchry. Co., Inc., Newark, N. J.
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Linde Air Prods. Co., The, 30 East 42nd St., N. Y. C.

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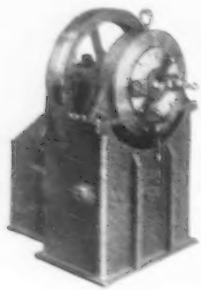
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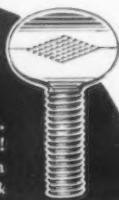
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Linde Air Prods. Co., The, 30 East 42nd St., N. Y. C.
Metal & Thermit Corp., 120 B'way, N. Y. C.
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Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

Youngstown (Ohio) Sheet & Tube Co.

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Stroine Tool & Mfg. Co., New Bremen, Ohio.

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Lewis Foundry & Mch. Co., Pittsburgh.
Stroine Tool & Mfg. Co., New Bremen, Ohio.

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Stroine Tool & Mfg. Co., New Bremen, Ohio.

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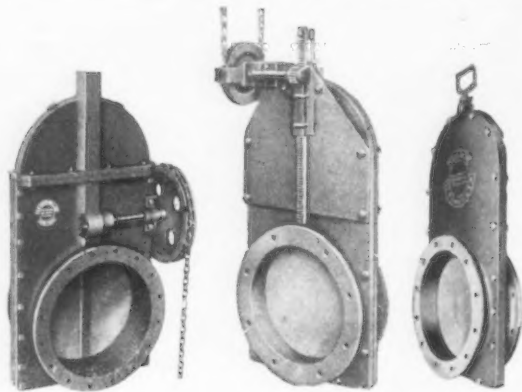
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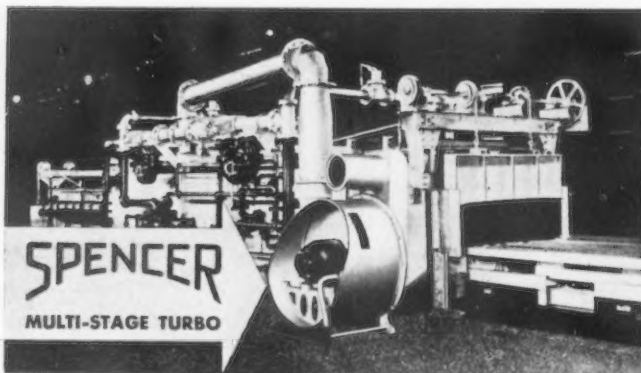
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- Ohio Electric Mfg. Co., Cleveland.
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- Union Drawn Steel Co., Massillon, Ohio.
- Weykoff Drawn Steel Co., Pittsburgh, Pa.

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 Ryerson, Jos. T. & Son, Inc., Chicago.
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Mesta Mch. Co., Pittsburgh.

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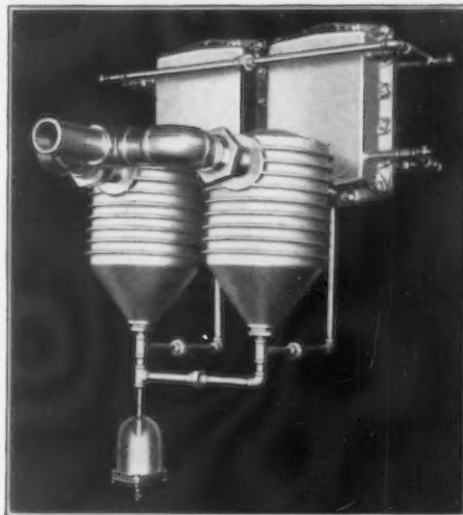
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Barnes-Gibson-Raymond, Inc., Detroit.
Cook Spring Co., Div. of Barnes-Gibson-Raymond, Inc., Ann Arbor, Mich.
Cuyahoga Spring Co., Cleveland.
Dunbar Bros. Co., Bristol, Conn.
Gibson, Wm. D., Co., Chicago.
Hubbard, M. D., Spring Co., Pontiac, Mich.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Miller & Van Winkle, Inc., 18 Bridge St., Brooklyn, N. Y.
Muehlhausen Spring Co., Logansport, Ind.
Raymond Mfg. Co., Corry, Pa.
U. S. Steel Wire Spring Co., Cleveland, O.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

SPROCKETS
Baldwin-Duckworth Chain Corp., Springfield, Mass.
Boston Gear Wks., Inc., North Quincy, Mass.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Morse Chain Co., Ithaca, N. Y.
Whitney Mfg. Co., Hartford, Conn.

STAMPINGS
Sheet Metal Specialty Co., Pittsburgh, Pa.

STAMPINGS OR DRAWINGS—Metal
American Nut & Bolt Fastener Co., Pgh.
Atlas Metal Products Corp., 150 Varick St., N. Y. C.
Barnes-Gibson-Raymond, Inc., Detroit.
Barnes, Wallace, Co., The, Bristol, Conn.

Budd, Edw. G., Mfg. Co., Philadelphia.
Champion Sheet Metal Co., Inc., Cortland, N. Y.
Cook Spring Co., Div. of Barnes-Gibson-Raymond, Inc., Ann Arbor, Mich.
Crosby Co., The, Buffalo, N. Y.
Dickey-Grabler Co., Cleveland.
Dunbar Bros. Co., Bristol, Conn.
Eastern Tool & Stpg. Co., Inc., Saugus, Mass.
Gauder, Paeschke & Frey Co., Milwaukee.
Gibson, Wm. D., Co., Chicago.
Globe Mch. & Stpg. Co., Cleveland.
Hubbard, M. D., Spring Co., Pontiac, Mich.
Lansing (Mich.) Stamping Co., So. Penn Ave.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Miller & Van Winkle, Inc., 18 Bridge St., Brooklyn, N. Y.
New Monarch Mch. & Stpg. Co., Des Moines, Iowa.
Parish Pressed Steel Co., Reading, Pa.
Raymond Mfg. Co., Corry, Pa.
Smith, Thomas, Co., 286 Grove St., Worcester, Mass.
Torrington (Ct.) Co.
Trucon Steel Co., Pressed Steel Div., Cleveland.
Veeder-Root, Inc., Hartford, Ct.
Worcester (Mass.) Stamped Metal Co.

STAMPS—Steel Alphabets and Figures
Dickey-Grabler Co., Cleveland.
Noble & Westbrook Mfg. Co., East Hartford, Ct.

STAPLES—Wire
Continental Steel Corp., Kokomo, Ind.
Titchener, E. H., & Co., Binghamton, N. Y.
Wickwire Brothers, Cortland, N. Y.

STEEL—Acid Resisting
Duriron Co., Inc., The, 438 N. Findlay St., Dayton, Ohio.

STEEL—Alloy
Alan Wood Steel Co., Conshohocken, Pa.
American Steel & Wire Co., Chicago.
Andrews Steel Co., The, Newport, Ky.
Bethlehem (Pa.) Steel Company.
Blissett Steel Co., The, Cleveland.
Carpenter Steel Co., 121 W. Bern St., Reading, Pa.
Columbia Steel Co., San Francisco, Calif.
Harrisburg (Pa.) Pipe & Pipe Bending Co.
Ingersoll Steel & Disc Co., Chicago.
Latrobe (Pa.) Electric Steel Co.
Ludlum Steel Co., Watervliet, N. Y.
Pacific Coast Steel Corp., San Francisco, Calif.
Republic Steel Corp., Youngstown, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Timken Roller Bearing Co., Canton, Ohio.
Timken Steel & Tube Co., The, Canton, O.
Universal Steel Co., Bridgeville, Pa.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL—Alloy, Cold Drawn
Bliss & Laughlin, Inc., Harvey, Ill.
Moltrup Steel Prods. Co., Beaver Falls, Pa.
Union Drawn Steel Co., Massillon, Ohio.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL—Bright Finished
Wyoff Drawn Steel Co., Pittsburgh, Pa.

STEEL—Carbon
Andrews Steel Co., The, Newport, Ky.
Carnegie Steel Co., Pittsburgh.
Carpenter Steel Co., 121 W. Bern St., Reading, Pa.
Columbia Steel Co., San Francisco, Calif.
Harrisburg (Pa.) Pipe & Pipe Bending Co.
Ingersoll Steel & Disc Co., Chicago.
Latrobe (Pa.) Electric Steel Co.

STEEL—Carbon Vanadium
Andrews Steel Co., The, Newport, Ky.
Latrobe (Pa.) Electric Steel Co.

STEEL—Chrome
American Steel & Wire Co., Chicago.
Andrews Steel Co., The, Newport, Ky.
Latrobe (Pa.) Electric Steel Co.

STEEL—Chrome Manganese
Latrobe (Pa.) Electric Steel Co.

STEEL—Chrome Nickel
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Ryerson, Joseph T., & Son, Inc., Chicago.
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Wyckoff Drawn Steel Co., Pittsburgh, Pa.

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American Steel & Wire Co., Chicago.
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Griffin Mfg. Co., Erie, Pa.

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Thomas Steel Co., Warren, Ohio.

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Pine & Tube Bending Corp. of America, Newark, N. J.

Pittsburgh (Pa.) Steel Co.

Steel & Tubes, Inc., Cleveland.

Timken Roller Bearing Co., Canton, Ohio.

Timken Steel & Tube Co., The, Canton, O.

Youngstown (Ohio) Sheet & Tube Co.

TUBING—Square and Rectangular

Steel & Tubes, Inc., Cleveland.

TUBING—Stainless Steel

Steel & Tubes, Inc., Cleveland.

TUBING—Tool Steel

Bissett Steel Co., The, Cleveland.

TUBING—Welded Steel

Columbia Steel Co., San Francisco, Calif.

National Tube Co., Pittsburgh.

Steel & Tubes, Inc., Cleveland.

Youngstown (Ohio) Sheet & Tube Co.

TUBULAR PRODUCTS

Pine & Tube Bending Corp. of America, Newark, N. J.

National Tube Co., Pittsburgh.

Steel & Tubes, Inc., Cleveland.

Wallace Supplies Mfg. Co., Chicago.

TUMBLING BARRELS—See Barrels—Tumbling

Tungsten Carbide

Carbidey Co., Inc., 2985 E. Jefferson Ave., Detroit.

Tungsten Electric Corp., Cleveland.

TURBINES—Steam

Murray Iron Wks. Co., Inc., Burlington, Iowa.

Sturtevant, B. F. Co., Hyde Park, Mass.

TURBO-COMPRESSORS

Spencer Turbine Co., Hartford, Conn.

TURNABLES

American Bridge Co., Pittsburgh.

TWIST DRILLS

Cleveland (Ohio) Twist Drill Co.

Morse Twist Drill & Mch. Co., New Bedford, Mass.

TYPE—Steel

Noble & Westbrook Mfg. Co., East Hartford, Ct.

UNIONS

Central Forging Co., The, Catawissa, Pa.

Crane Co., Chicago.

Dart, E. M. Mfg. Co., Prov., R. I.

VALVE DISCS

Garlock Packing Co., The, Palmyra, N. Y.

VALVES—Acid Resisting

Duriron Co., Inc., The, 428 N. Findlay St., Dayton, Ohio.

VALVES—Air Operating

Westinghouse Air Brake Co., Industrial Div., Pittsburgh.

VALVES—Gas, Water and Steam

Crane Co., Chicago.

Jarecki Mfg. Co., Erie, Pa.

Wood, R. D. & Co., Philadelphia.

VALVES—Hydraulic

Baldwin-Southwark Corp., Southwark Div., Philadelphia.

Crane Co., Chicago.

Wood, R. D. & Co., Philadelphia.

VALVES—Pump, Rubber

Garlock Packing Co., The, Palmyra, N. Y.

VARNISH

Adair & Wiborg Corp., 75 Varick St., N. Y. C.

VARNISH—Acid Resisting

Nukem Products Corp., 68 Niagara St., Buffalo.

VICES

Desmond-Sterhan Mfg. Co., Urbana, Ohio.

Jarecki Mfg. Co., Erie, Pa.

VICES—Machine

Hendey Machine Co., Torrington, Conn.

WASHERS—Felt

Booth Felt Co., Inc., 477-19th St., Bklyn., N. Y.

Western Felt Works, Chicago.

Products Index

WASHERS—Iron or Steel
American Nut & Bolt Fastener Co., Pith.
Central Iron & Steel Co., Harrisburg, Pa.
Smith, Thomas, Co., 280 Grove St.,
Worcester, Mass.

WASHERS—Leather
Chicago (Ill.) Rawhide Mfg. Co., 1306
Elston Ave.
Rhoads, J. E., & Sons, Philadelphia.
Schieren, Chas. A., Co., 30 Ferry St.,
N. Y. C.

WASHERS—Lock
American Nut & Bolt Fastener Co., Pith.
WATER SOFTENERS AND PURIFIERS
Sealife, Wm. B., & Sons Co., Pith.

WELDING—Electric
Electric Arc Cutting & Welding Co.,
Newark, N. J.
Federal Machine & Welder Co., Warren,
Ohio.

National Elec. Welding Machines Co., Bay
City, Mich.
Pittsburgh (Pa.) Welding Corp.
Thomson-Gibb Elec. Welding Co., Lynn,
Mass.

Tickle, Arthur, Engng. Wks., Inc., 21
Delevan St., Bklyn., N. Y.
Universal Power Corp., Cleveland.
Westinghouse Elec. & Mfg. Co., East Pith.

WELDING—Thermic
Metal & Thermit Corp., 120 B'way,
N. Y. C.

**WELDING AND CUTTING MACHINES
AND EQUIPMENT—Oxy-Acetylene**
Air Reduction Sales Co., 60 East 42nd
St., N. Y. C.

Linde Air Prods. Co., The, 30 East 42nd
St., N. Y. C.
Weldit Acetylene Co., Detroit.

WELDING MACHINES—Butt
Federal Machine & Welder Co., Warren,
Ohio.
National Elec. Welding Machines Co., Bay
City, Mich.

Thomson-Gibb Elec. Welding Co., Lynn,
Mass.

WELDING MACHINES—Electric Arc
Electric Arc Cutting & Welding Co.,
Newark, N. J.

General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4401 W. National
Ave., Milwaukee, Wis.

Lincoln Electric Co., Cleveland.
Universal Power Corp., Cleveland.
Westinghouse Elec. & Mfg. Co., East Pith.

**WELDING MACHINES—(Electric Arc)
Second Hand**
Goodman Elec. Mchry. Co., Newark, N. J.

WELDING MACHINES—Flash
Federal Machine & Welder Co., Warren,
Ohio.

National Elec. Welding Machines Co., Bay
City, Mich.
Thomson-Gibb Elec. Welding Co., Lynn,
Mass.

WELDING MACHINES—Press
Federal Machine & Welder Co., Warren,
Ohio.

National Elec. Welding Machines Co., Bay
City, Mich.
Thomson-Gibb Elec. Welding Co., Lynn,
Mass.

WELDING MACHINES—Seam
Federal Machine & Welder Co., Warren,
Ohio.

National Elec. Welding Machines Co., Bay
City, Mich.
Thomson-Gibb Elec. Welding Co., Lynn,
Mass.

WELDING MACHINES—Spot
Elder Engineering Co., Inc., 754 S. 13th
St., Newark, N. J.

Federal Machine & Welder Co., Warren,
Ohio.
National Elec. Welding Machines Co., Bay
City, Mich.

Thomson-Gibb Elec. Welding Co., Lynn,
Mass.

**WELDING MACHINES—Universal Spot
& Arc**
Electric Arc Cutting & Welding Co.,
Newark, N. J.

WHEELS—Rolled Steel
Pittsburgh Steel Co., Pittsburgh.
Pittsburgh Steel Co., Chicago.

WIRE—Aluminum
Aluminum Co. of America, Pittsburgh.
WIRE—Barb
Continental Steel Corp., Kokomo, Ind.

Jones & Laughlin Steel Corp., Pittsburgh.
Pittsburgh (Pa.) Steel Co.
**WIRE—Brass, Bronze, Copper, Nickel,
Silver or Phosphor Bronze**
Michigan Wire Cloth Co., 2117 Howard
St., Detroit.

Phosphor Bronze Smelting Co., Phila.
Riverside (N. J.) Metal Co.
Saxony (Conn.) Mfg. Co.
WIRE—Electric Heat Resisting
Globe Corp., Niagara Falls, N. Y.

**WIRE—Flat, Round, Square or Special
Shapes**
American Steel & Wire Co., Chicago.

Barnes Wallace Co., The, Bristol, Conn.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.

Johnson Steel & Wire Co., Inc., Worcester,
Mass.
New England High-Carbon Wire Co., Mill-
bury, Mass.

Worcester (Mass.) Wire Wks. Div., Na-
tional Standard Co.

WIRE—Insulated
American Steel & Wire Co., Chicago.
Roebbing's, John A., Sons Co., Trenton, N. J.

WIRE—Mattress
American Steel & Wire Co., Chicago.
Roebbing's, John A., Sons Co., Trenton, N. J.

Worcester (Mass.) Wire Wks. Div., Na-
tional Standard Co.

WIRE—Netting
Continental Steel Corp., Kokomo, Ind.
Roebbing's, John A., Sons Co., Trenton, N. J.

Wickwire Brothers, Cortland, N. Y.
WIRE—Piano and Music
Johnson Steel & Wire Co., Inc., Worcester,
Mass.

New England High-Carbon Wire Co., Mill-
bury, Mass.

Webb Wire Works, New Brunswick, N. J.
Wickwire Spencer Steel Co., 41 East 42nd
St., N. Y. C.

Worcester (Mass.) Wire Wks. Div., Na-
tional Standard Co.

WIRE—Special, Drawn Shapes
Bathbone, A. B., & J. Palmer, Mass.

WIRE—Spike and Crimping
Seneca Wire & Mfg. Co., The, Fostoria,
Ohio.

WIRE—Spring
American Steel & Wire Co., Chicago.
Barnes Wallace Co., The, Bristol, Conn.

Johnson Steel & Wire Co., Inc., Worcester,
Mass.
Jones & Laughlin Steel Corp., Pittsburgh.

New England High-Carbon Wire Co., Mill-
bury, Mass.
Pittsburgh (Pa.) Steel Co.

Roebbing's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., The, Fostoria,
Ohio.

Worcester (Mass.) Wire Wks. Div., Na-
tional Standard Co.

WIRE—Stainless Steel
Page Steel & Wire Co., Monessen, Pa.

WIRE—Steel
Johnson Steel & Wire Co., Inc., Worcester,
Mass.

Wickwire Brothers, Cortland, N. Y.

WIRE—Welding
Air Reduction Sales Co., 60 East 42nd
St., N. Y. C.

American Steel & Wire Co., Chicago.
Lincoln Electric Co., Cleveland.
Metal & Thermit Corp., 120 B'way,
N. Y. C.

Page Steel & Wire Co., Monessen, Pa.
Pittsburgh (Pa.) Steel Co.
Roebbing's, John A., Sons Co., Trenton,
N. J.

Seneca Wire & Mfg. Co., The, Fostoria,
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Wickwire Brothers, Cortland, N. Y.

Wickwire Spencer Steel Co., 41 East 42nd
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Buffalo (N. Y.) Wire Wks. Co., Inc.
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Seneca Wire & Mfg. Co., The, Fostoria,
Ohio.

Wickwire Bros., Cortland, N. Y.
Wickwire Spencer Steel Co., 41 East 42nd
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No. 3 Brown-Sharpe Plain
No. 4 Cincinnati Plain

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No. 3-B Milwaukee
No. 3-B Brown-Sharpe
No. 3 Cincinnati H.P.
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No. 1 Warner-Swasey Universal
No. 1-A Warner-Swasey Universal

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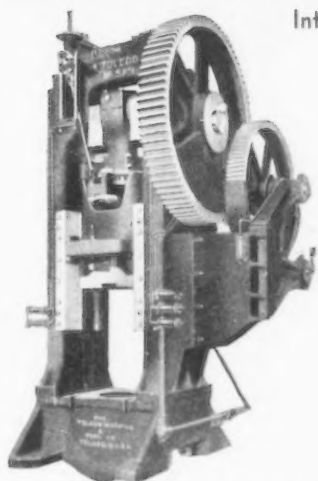
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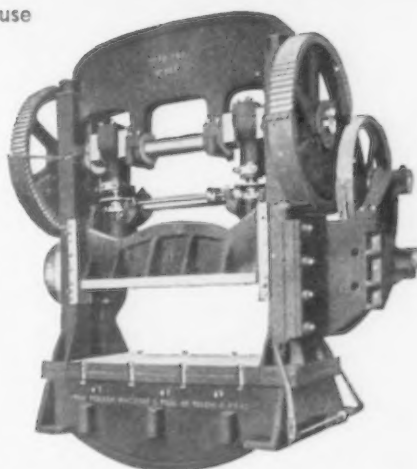
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Electric Welders

1—Taylor Winfield Type DE-60 Rear Panel Butt Welder—250 KW per side—333 KVA—750 Amp—440 Volt—60 cycle, Serial 1929.

1—Federal Type D, Double Seam Flash Welder, 200 KW per side—30 cycle per side, motors and brake coils 60 cycle—440 Volt, Serial 4761.

1—12 KVA Gibb Spot Welder, type S—440 Volt—50 cycle, Serial 8126.

1—60 KVA Gibb Spot Welder, type SM-18, air operated, 440 Volt—60 cycle, Serial 4085.

1—15 KW Taylor Winfield Spot Welder, 20 KVA—45 Amp, 440 Volt—60 cycle.

1—Moesta Portable Gun Welders, Mfr., Taylor Winfield Co., 50 KW—67 KVA—440 Volt—60 cycle.

1—7 1/2 KW—200 Amp, Gibb Arc Welder, Type ARC—25 KVA—440 Volt—60 cycle, Serial 659.

1—200 Amp, Lincoln Arc Welder, stationary with base and switchboard.

1—300 Amp, General Electric Arc Welder, 15 H.P., G. E. Motor, type FT-954, Serial 1961, 440 Volt—3 phase—60 cycle—1800 R.P.M.

Machine Tools

1—Gisholt Simplomatic Lathe, with hardened ways, 18"—3 jaw Air Chuck, motor drive, with 15 H.P. Fairbanks Morse B.B. Motor, 220 440 Volt—3 phase—60 cycle—1200 R.P.M., Tex Rope Drive.

2—Rockford Double Head Horizontal Drilling Machines, 10 and 12 spindle each with 2-5 H.P. Fairbanks Morse 440 Volt—3 phase—60 cycle—1200 R.P.M. Motors.

2—Ingersoll Open Side Milling Machines, length of bed 14", three heads, direct M.D., with 15 H.P. Fairbanks Morse B.B. Motor, 220 440 Volt—3 phase—60 cycle—1200 R.P.M.

1—36" x 36" x 14' Cincinnati Planer, single head on rail, with 5 H.P.—440 Volt—3 phase—60 cycle Slip Ring Motor.

3—Gould & Eberhardt 4 spindle Gear Millers, with indexing fixture for milling, 4 gears simultaneously and unloading and reloading idle half of fixture, Automatic lubrication to all bearings, with change gears and C. S.

1—Ingersoll Band Rotary Milling Machine with six cutter heads, direct Motor Drive with 25 H.P. Fairbanks Morse B. B. Motor, 220 440 Volt—3 phase—60 cycle—1200 R.P.M.

1—24 Spindle Distance Drilling Machine with 15 H.P. Fairbanks Morse Motor mounted in head, 220 440 Volt—3 phase—60 cycle—1200 R.P.M.

1—Gardner 284 Double Disc Grinder, with 2—7 1/2 H.P.—440 Volt—3 phase—60 cycle—1200 R.P.M. Motors.

6—Bryant 26 Internal Grinders, variable speed Belt Drive.

3—Libby 18" Chucking Turret Lathes, six head turret, cross slide, 18"—3 jaw Air Chuck, Base for M.D.

5—6" Gleason Bevel Gear Shapers, compound pump and tank, indexing change gears, single pulley drive.

20—Pratt & Whitney 2 Spindle Gun Drilling Machines, 9 with base for M. D. and 11 with countershaft.

1—West Side Iron Works, 278—42" Metal Cutting Band Saw.

2—Jones Superior 42" Metal Cutting Band Saws with base for M.D.

1—36" P. S. & W. Metal Squaring Shear, foot power, 15" throat, capacity 16 Ga.

1—Pexto 36" Metal Squaring Shear, capacity 18 Ga.

1—Cochrane Bly 24B Metal Saw, with pump, tanks and base for M.D.

1—Gleason Pedestal Gear Grinder, for sharpening Fellows Cutters, with guards (C. S.).

3—Automatic Machinery Co. six spindle Profilers with fixed heads and base for M.D.

3—J. N. LaPointe 2 Spindle Broaches.

6—Fitchburg Lo-Swing Lathes with countershaft.

1—Prentice 27—4 ft. Radial Drill, quick change, geared head, bracket for M.D.

1—Newton 4 spindle Horizontal Milling Machine, with base for M.D.

1—Baker 4 spindle Drill Press, fixed heads with 24" centers, 3" spindles, 25 Morse Taper.

6—4 and 6 spindle Moline Hole Hogs, adjustable heads, arranged for M.D.

2—Ingersoll Cutter Grinders with base for M.D.

200—Other tools of almost every kind.

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- 1-36"x40" American, m.d., taper

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- 3" American High Speed B.B. Sensitive
- 3" Carlton H.S. Sensitive
- 3" Fostick H.S. Sensitive
- 3 1/2" Morris Plain Radials, gear box drive
- 3 1/2" F. 5" 6" Cincinnati Bickford Plain Radials, gear box drive
- 4" Drees Plain Radial, gear box
- 4" Fostick Plain Radial, gear box
- 5" 6" American Triple Geared Plain Radial, gear box
- 5" 6" American Triple Purpose gear box on base
- 6" Niles-Rement-Pond Plain, variable speed m.d.
- 7" Fostick Plain, cone
- No. 1 W. F. & John Barnes Horizontal Radial, cone
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- 2 spindle Fostick H.S. B.B.

- 1-2-3 spindle Henry & Wright H.S. B.B.
- 1-2-4 spindle Leland & Gifford H.S. B.B.
- 4 spindle Avey, latest type
- 2-3 spindle Sipp H.S. B.B.
- 3 spindle No. 2 Colburn H.D. Mfg.
- 3 spindle Demco H.S. B.B.
- 3 spindle Hofer 22" Gang Drill
- 3 spindle 22" Rockford Gang
- 1-3-6 spindle Avey H.S. B.B.
- 4 spindle 20" B.F. Barnes Gang
- 4 spindle 22 1/2" W. F. & John Barnes Gang Drill
- 4 and 6 spindle Moline Hole Hogs
- 6 spindle 21" Hofer Gang Drill
- 6 spindle Hofer 22" Gang Drill
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- No. 008, 188 Garvin Horizontal Duplex Drills
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- No. 15 Foster-Barre 2 spindle H.D. Rail Drill
- No. 25 Rausch Multiple Spindle
- No. 26 Fox Multiple Drill and Tapper
- No. 36 Nates Multiple Spindle
- No. 37 type K Nates Multiple
- Nos. 121, 216, 217, 220, 310, 314, 417 Baker H.D. Drills
- D2, D3, D4 Colburn H.D. Drills
- Nos. 21", 24", 28", 32", 36" Aurora Upright Drills
- 20", 22", 26", 34" Barnes Upright
- 21", 24", 28", 36" Cincinnati Bickford Upright Drills
- 21", 25" Weigel Upright Drills
- 21", 25" Superior Upright Drills
- 26", 26" Barnes All Geared Drills
- No. 2 Colburn Mfg. Type H.D.
- Nos. 2-4, 22 Colburn Mfg., latest type

BORING MILLS

- 40" King Vertical, 1 turret head, 1 solvel head
- 21", 36" Bullard New Era, m.d.
- 21", 36" Bullard Rapid Production
- 36" Colburn Vertical
- 37" Niles Vertical, 2 heads, m.d.
- 60" Bausch Vertical
- 62" Niles Vertical, m.d. B.F.L.
- 64" Bullard Spiral Drive, latest type

- 72" Bickford Vertical, 2 heads
- 72" Niles Vertical, 2 heads
- No. 6 Giddings & Lewis Horizontal, s.p.d.
- No. 6 Fostick Horizontal, s.p.d.

MILLING MACHINES

- No. 4 Cincinnati Universal, s.p.d. late type
- No. 1 Cleveland Universal, s.p.d.
- No. 16 LeBlond Universal, s.p.d.
- Nos. 1 1/2, 2, 3 Brown & Sharpe Universal, s.p.d.
- No. 2A Hendey-Norton Universal, s.p.d.
- No. 3A Heavy Brown & Sharpe Universal, arr. m.d.
- No. 3 Keppsmith Univ., s.p.d.
- No. 3 Ohio Universal, s.p.d.
- Nos. 2-4 Cincinnati Vertical, m.d. and s.p.d.
- No. 24R Milwaukee Vertical, m.d.
- No. 3 Beker Vertical, belt
- No. 15R Brown & Sharpe Plain, National Standard spindle, latest
- Nos. 3B, 3R Heavy, 3R Heavy, 5R Heavy Brown & Sharpe Plain, arr. m.d. taper spindle nose
- Nos. 2, 3, 4, 5 Cincinnati Plain, round overarm, s.p.d.
- Nos. 1, 3 Keppsmith Plain, cone
- Nos. 1 1/2, 2, 3 Brown & Sharpe Plain, cone
- Nos. 1 1/2, 2, 3, 4 Cincinnati Plain, cone
- Nos. 2B, 3R Milwaukee Plain, m.d. and s.p.d. Univ., s.p.d.
- No. 1 United States Hand cone
- No. 2 Pratt & Whitney Hand, cone
- 24", 18" Cincinnati Plain Automatic
- 24" Cincinnati Duplex Automatic m.d. late
- 18", 24" Cincinnati Duplex Automatic, belt
- No. 1 Bezman & Smith Sash
- 18"x12"x8" Ingersoll Planer type

GEAR MACHINERY

- Nos. 6, 61 Fellows Gear Shapers
- Nos. 7, 715 Fellows H.S. Gear Shapers
- Nos. 3, 4, 13, 13H Brown & Sharpe Gear Cutters
- No. 5A Lees-Bradner Gear Generators, belt and m.d.

- Nos. 18H, 18HW Gould & Eberhardt Gear Hobbers
- Nos. 2, 12 Barber-Colman Gear Hobbers
- No. 12 Barber-Colman Gear Hobber, double overarm
- 6", 11", 18" Gleason Bevel Gear Generators
- No. 26RM Gould & Eberhardt 3 spindle Gear Rougher
- 12", 30" Ingle Gear Tooth Rounders

GRINDERS

- 56"x84" Diamond Face Grinder, m.d. Oilgear drive, latest
- 22" Pratt & Whitney Vertical Surface, ball bearing
- No. 72A5 Heald Sizeromatic, m.d. latest
- No. 2-4 Brown & Sharpe Universal, m.d. late type
- Nos. 1, 2, 3, 4 Brown & Sharpe Universal, belt drive
- No. 4 Landis Universal, belt
- No. 15 Brown & Sharpe Universal
- No. 70 Heald Internal
- No. 3 Rivett Internal
- No. 1 LeBlond Universal Tool & Cutter
- No. 2 Jesterlein Universal Tool & Cutter
- No. 2 1/2 Oliver Motor Driven Drill Pointers
- No. 2 Diamond Automatic Surface Grinder
- Nos. 2, 3 Wilkox & Morman Automatic Surface Grinder
- 14" Pratt & Whitney Surface Grinder, belt
- No. 200-8" Heald Ring Grinder, belt
- 60" Bridgeport, Face, belt
- No. 34 Bridgeport H.D. Face, arranged m.d. with A.C. motors, Oilgear Table Drive, latest type
- No. 35 Abrasive Vertical Surface, motor in base
- No. 16, 26" Blanchard belt
- No. 51 Besly Motor Driven Disc, A.C. motor
- No. 126 Gardner Combination Disc, belt
- No. 14 Gardner Double Disc, belt
- 16"x52" Landis Plain Cylindrical
- 12"x72", 10"x50", 10"x36", 16"x36", 6"x32" Norton, belt and m.d.

- 6"x18", 10"x30", 10"x36", 12"x36", 12"x52", Landis Plain Self-Contained Cylindrical, arr. m.d.
- Nos. 60, 65 Heald Cylindrical

PLANERS

- 62"x48"x28" Cincinnati, arr. m.d., 4 heads
- 62"x62"x60" Cincinnati, arr. m.d., 4 heads
- 48"x48"x20" Cincinnati, arr. m.d., 4 heads
- 23"x33"x8" Ohio Planer, belt, 2 heads
- 30"x30"x14" Cincinnati, belt, 2 heads
- 30"x30"x10" American, belt, 1 head
- 24"x24"x14" Cincinnati, 2 heads
- 28"x28"x8" G. A. Gray, 1 head
- 24" Cincinnati Crank Planer

TURRET LATHES, MFG. LATHES, AND SCREW MACHINES

- No. 6 DP Potter & Johnson Automatic, latest type
- Nos. 2A, 3A Warner & Swasey Universal, bar equip.
- Nos. 2A, 3A Warner & Swasey Universal, chucking
- No. 4 Warner & Swasey Universal, bar
- Nos. 1, 2, 3, 6, 8 Warner & Swasey Turret
- Nos. 3A, 6A Potter & Johnston Automatics
- 2x24", 3"x36" Jones & Lamson Flat Turret
- 3x36" Jones & Lamson 2 spindle Flat Turret
- 3x4" Gridley Single Spindle Automatic
- 12", 21", 24" Gisholt Turret
- Nos. 23, 24 New Britain Automatics
- 18", 26" Libby Turret
- No. 5, 7 Bardsley & Oliver Turret
- Nos. 33, 54, 55 National Acme Automatics
- 24" Steinfeld Turret
- Nos. 6, 9 LeBlond Multi-Cut
- 21"x10" LeBlond Mfg.
- 9x12", 9x21" Sundstrand Mfg.
- 9x14", 9x20" Porter-Cable Mfg.
- No. 6 Reed-Prentice Mfg.
- 15"x6" Automatic Threading Lathe
- 17"x6" LeBlond Rapid-Production
- No. 6D Potter & Johnston, m.d., late type

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MILWAUKEE No. 2B, 3B, 4B Plain

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MILWAUKEE No. 2, 3 S.P.D.
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GRINDERS—Internal

HEALD No. 70, No. 72, No. 75
HEALD No. 50, No. 55, No. 60, No. 65
BRYANT No. 6, No. 15, No. 18
VAN NORMAN No. 3½, No. 34

GRINDERS—External

BROWN & SHARPE No. 10, No. 11, No. 14
NORTON 6x32", 10x36", 10x72", 16x50",
18x96"
LANDIS 6x18", 10x36", 10x52", 10x72",
12x72"

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NORTON 16x50", 14x36" BA

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- HAMMER**—No. 6-B Nazel. Capacity 7" Sq. Mild Steel. Motor Drive
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- PRESS-HYDRAULIC**—10,000-ton Chambersburg 24" dia. columns. Oblong platen 12' 5" x 17'. Stroke 24". Approx. weight 1,000,000 lb.
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- PRESS-HYDRAULIC WHEEL**—Caldwell 180 ton. 9½" dia. Ram. Distance bet. parallel bars 38". Bars 6½" x 2"
- PRESS-HYDRAULIC WHEEL**—Chambersburg 300 ton. Distance bet. parallel bars 50". End of ram to outer support 11'
- PRESS**—No. 6½ Bliss Str. Side Dble. Crank Stroke 8". 54" between housings.
- PRESS**—No. D-501 Ferracute Straight Side Single Crank. Stroke 12". Distance between housings 32".
- PRESS**—No. 57½ Toledo Str. Side Single Crank. Stroke 10". 28" bet. housings
- PRESS**—No. 59½ Toledo Str. Side Single Crank. Stroke 8". 40" bet. housings
- PRESS**—No. 60½ Toledo Str. Side Single Crank. Stroke 18". 50" bet. housings
- PRESS**—No. 514 Bliss Str. Side Single Crank. Stroke 19". 33½" bet. housings
- PRESS**—No. 412 Bliss Toggle Drawing Dble. Crank. Stroke 22". 86" bet. housings
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- SHAPER**—32" Columbia Heavy Duty. Crank Back Geared. Chuck 16" wide.
- SHEAR**—12' Hyde Park Squaring. Cap. ¼". Table 23" wide, 14' 3" long, 16" gap
- SHEAR**—No. 10 Buffalo for bars & shapes. Capacity up to 3½"
- STRAIGHTENING & CUTTING MACHINE**—¾" Shuster. Cap. ¼" to ¾". Length of cut-off 12'
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25 V. & O. Press, stroke 5 1/2", ram 12", flywheel type.
(2) 25A Toledo Power Flywheel Presses, O.B.L., stroke of slide 3", weight 5200 lbs., direct motor drive with motor, 3 phase, 50 cycle, 440 volt, 900 RPM, capacity 30 tons.

25A Toledo Geared Press, O.B.L., stroke of slide 3", weight approximately 5700 lbs., capacity 30 tons.

(2) 26 Toledo Geared Presses, O.B.L., stroke 4 1/2", standard die-space, capacity 55 tons; weight 8200 to 9000 lbs.

27 Bliss Consolidated Power Press, with King Spring Toggle Knockout attachment, built in 1929, 3" stroke, bed to slide stroke down, adjustment up 1 1/2", belt driven, back geared, arranged for motor drive. Serial number H7311 HP-285, equipped with bolster plates.

2108 Toledo Toggle Deep Drawing Press, weight about 57,000 lbs. Area of bed 18" x 40". Distance between plungers 40". Stroke of blankholder 18". Stroke of plunger 26".

8" Oil Power Press or Brake, weight about 24,000 lbs., capacity 210 cu. in. arranged for direct motor drive with A.C. motor, push button control.

10" Oil Power Brake, 16 gauge, geared and clutch pulley drive, with countershaft, 10 1/2" between housing, size of shaft 1", size of main gear wheel 60".

16" Loy & Newirth Power Shear, 1/4" capacity, 23" x 10" bed, double geared, pulley drive with countershaft, extra set of blades.

21 Hilke & Jones Horizontal Punch and Bender, capacity for bending or straightening 12" I-beams capacity of punch 3/4" x 3/4", 12" throat; machine arranged for direct motor drive.

26" x 15" x 18" Chicago Pneumatic Tool Company Air Compressor, serial number 7861; type OCELI, capacity 2200 cu. ft. per minute, direct connected to 400 H.P. General Electric Synchronous motor, 200 RPM, type FTH, 2200 volts, 3 phase, 60 cycles, completely with hand switch, etc. Serial number of motor 366724.

(2) 20" x 8" American Lathes, 3 step cone, quick change gear, double back geared, equipped with chuck.

20" x 8" Lodge & Shipley Lathe, quick change gear, complete with chuck and steady rest.

21" x 12" Schumacher & Boye Lathe, quick change gear, compound rest, steady rest, chuck, 3 step cone, double back gear, 2" hole in spindle.



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50" x 60" McMyler Lathe, screw cutting, rapid power traverse to carriage arranged for D.C. motor drive, no motor, complete with gears and steady rest.

60" x 50" Pond Engine Lathe, screw cutting, triple geared, fast plate drive, 8" hole in spindle, distance between centers 40", swings 44 1/2" over saddle complete with chuck jaws, steady rest, countershaft, etc.

26 Warner & Swasey Turret Lathe, wire feed, power feed to turret and cross slide, serial number 108299.

(2) 6" American Radial Drills, triple purpose type, motor drive through gear box.

216 Blanchard Grinder, motor in head, 3 phase, 60 cycle, 220 volts.

30" dia. magnetic chuck.

2 1/2" 1 1/2" 1 1/4" Gridley Automatics.

18" x 12" Reed Prentice Geared Head Lathe.

42" x 42" x 12" Detrick & Harvey Open-side Planer, two heads on rail, one side head, arranged for motor drive.

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5" bar, Niles Bement Pond Horizontal Boring Mill, motor drive, with surface plate and outboard support.

210 Jackson Duplex Typeless Die Sinker, arranged for motor drive, equipped with churning attachment, vertical travel of head 27", distance face of column to spindle 18 1/2". Maximum distance table to spindle 30".

26" Wiegall Upright Drill, sliding head, geared feed, tight and loose pulley drive.

21" Cincinnati Upright Sliding Head Drill Press, self contained belt drive, back geared, quick change feed, tapping attachment, table 22" diameter.

30 KVA Z & H Spot Welder, Toledo, 220 volts, 60 cycle, single phase, serial number 433. This machine is A.C. current 3 phase, and has a controller that controls the top and lower bar for regulating heat.

60 KVA Thompson Spot Welder, M.D. with extra transformer 25 cycle, 220 volt, 60 cycle, 3 phase, A.C. serial 286. Arms can be extended for welding 24" and you can weld two pieces of 1/4" thick together, also has an extra 25 cycle transformer.

(2) 10 1/2" x 16" Gould Triplex Pumps, model 1585, serial numbers 31686 and 31627, capacity 750 gallons per min. at 150 lbs. pressure. Both machines arranged for direct motor drive with sprocket chain arrangement.

Oilgear High Pressure Pump, for oil type W.E.L. 834 RPM, 1600 lb. per sq. in. pressure, direct connected to a 5 H.P. Westinghouse motor, 3 phase, 60 cycle, 220 volt, 1160 RPM, capacity 3500 cu. ft. per min. 13 gal. per min.

22 Hilke & Jones Plate Bending Rolls, 9 1/2" diameter upper roll, 18" dia. lower rolls, 12" between housings.

42" x 1/2" Ryerson Lenox throat splitting rotary shear, approximately 18 years old, capacity to handle 12" x 1/2" material.

Steel Stiff Leg Derrick and Hoist, 85 ft. boom, 45 ft. mast, complete with National Hoisting engine and swinger, direct motor drive, 80 H.P. 3 phase, 60 cycle, 440 volts, with clam shell bucket.

8" Suction Pump, on enclosed barge, direct motor drive with 100 HP General Electric motor, 3 phase, 60 cycle, 170 volt.

Mill Room Crane, 25 ton, Northern, 3 motors, 6574" span, 230 v. D.C.

10 Ton Niles Crane, 45' span, 3 motors, 230 volt D.C.

20 Ton Niles Crane, 65' span, 3 motors, 230 volt D.C.

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- 8 Stands 10" Mill, with two pinion stands, D.C. motor drive
- 5 Stands 12" Mill, with pinion
- 2 Stands 14" Mill, A.C. motor drive
- 5 Stands 20" Mill, with pinions

All above Mills are 3-high, top and bottom screw adjustment

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- 2—10 x 12" United Engr. & Fdry. Cold Mills
- 1—8 x 5" Schmitz Flat Wire Mill
- 3—16" dia. x 15" face U. E. & F. Take-off Reels
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- 1—No. 3 U. E. & F. Bar Shear
- 1—No. 3 1/2 U. E. & F. Bar Shear
- 1—Roll Turning Lathe, suitable for turning 20" x 72" Rolls
- 1—1576 cu. ft. Chicago Compressor, with 440 volt, 300 H. P. synchronous motor
- 1—10 x 12" Pennsylvania Compressor with 65 H. P., 220 volt synchronous motor

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- 26/48" x 14" McCabe, 2-spindle
- 48" x 34-ft. Pittsburgh, Q.C.G.
- 45" x 27-ft. Pond, Geared Head
- 18/36" x 8" Fay & Scott, S.H.
- 26/29" x 12" Boye & Emmes, Taper
- 26/28" x 14" Pond, Q.C.G., Taper
- 26" x 12 ft. Putnam, Cone, Q.C.G.
- 26" x 12-ft. Bridgeford, Q.C.G.
- 24/27" x 14" Reed-Prentice, G.H.
- 24/26" x 10" American, S.P.D.
- 18/20" x 8" Reed-Prentice, M.D.
- 16/18" x 8" Greaves-Klusman, TA
- 14/16" x 6" Lodge & Shipley
- No. 1-B Foster Univ. Turret
- No. 2 Warner-Swasey, 1" cap.
- Nos. 55 & 53 National Acmes
- No. 33 New Britain Chuck.

DRILLS, RADIAL, UPRIGHT, MULTIPLE

- 5-ft. Dresses, S.P.D., Gear Box
- 3 1/2-ft. & 3-ft. Ctn-Rickford, SPD
- 2 1/2-ft. Foodlick, SPD, Gear Box
- 30" Hofer; 24" Cincinnati, TA
- 1-sp. Barnes, 22 1/2" Style B, HD
- 2-sp. Barnes, 20" Auto, Ford
- 6-sp. Allen, 12" overhang, No. 2 TA
- 3 & 4-sp. Allen, 7" overhang
- 1-sp. Henry & Wright, 8" overhang
- 2-sp. Avery No. 1, 7 1/2" overhang
- No. 12 P. & W., 12-sp., power feed

MILLING MACHINES

- Universal: No. 3 Kempsmith, MD
- No. 3 LeBlond, Cone
- No. 2-A Hendey, G.H.
- No. 2 Cincinnati, Cone
- No. 2 Brown & Sharpe
- Plain: No. 5 & 2 Cincinnati, GH
- No. 3B & 1B Brown & S.
- No. 2RS & 2AS Milwaukee
- No. 2 Kempsmith, S.P.D.
- No. 2 & 1 Kempsmith, Cone
- Production: No. 33 Kempsmith
- 18" Cincinnati Duplex
- Vertical: No. 2 & 1 Knight (2)

BORING MACHINES

- 60" Niles-Bement-Pond, M.D.
- 48" Colburn, Self-contained
- No. 31 Lucas, 5" bar, Rotary Tool
- 3 1/2" D. & H., Floor Type

GRINDERS

- 16" x 96" Norton, Self-cont.
- 10" x 50" Norton, Self-cont.
- No. 2 Oakley Univ. Tool & C.
- No. 2 Oakley Univ. Tool & C.
- No. 2 Sellers, MD—NEW

SHAPERS, PLANERS

- 24" Stockbridge, A.C. M.D.
- 24" Queen City, Cone
- 20" Gould & Eberhardt, M.D.
- 20" Kelly, Cone
- 16" Hendey, A.C., M.D. (2)
- 16" Cincinnati; Stockbridge; MD
- 36" x 42" x 12" Cincinnati Planer
- 24" x 6-ft. Cincinnati Planer
- 42" D. & H. Open Side Planer

PUNCHES, SHEARS, ROLLS, PRESSES

- No. 20 Pels, BLUEFG Punch
- 10" x 1/4" Niagara Shear, 18" Gap
- 10" x 10-ga. Niagara Shear, 15" Gap
- 8" x 3/16" Ohi Squaring Shear
- 8" x 10-ga. Loy & Newirth Shear
- 36" x 14-ga. Niagara Shear
- 8" x 3/16" Niagara Pinch Rolls
- No. 44 Toledo Horning—Geared
- No. 73 1/2 Bliss, S.S., Geared
- No. 41 Adlance, Dbl. Action
- 200-ton Niles Hyd. Wheel Press
- 15-ton Hercules Vert. Press Broad

MISCELLANEOUS

- Gear Cutter, 60" Brown & Sharpe
- Gear Hobber, 18 H. Gould & Eber.
- Gear Generator, 6" Gleason, Bvl.
- Broach, No. 4 La Pointe, Mech.
- Hammer, 300-lb. Beaudry
- Hack Saws, 6" Peerless, M.D.
- Hack Saws, 4" Racine, M.D.

SURPLUS EQUIPMENT

Rebuilt SUTTON ENGINEERING CO. Straighteners

1—No. 0—Very latest design, totally inclosed, direct motor drive, angle adjustment to driving rolls, micrometer adjustment idle rolls, Timken Roller Bearings, capacity $\frac{1}{4}$ " to $\frac{3}{4}$ " bars and tubes.

1—No. 1 Standard, direct motor drive, Timken Roller Bearings, capacity bars $\frac{1}{4}$ " to $\frac{3}{4}$ ", tubes $\frac{3}{8}$ " to $2\frac{1}{2}$ " O.D.

1—No. 2 Standard, direct motor drive, Timken Roller Bearings, capacity bars $\frac{1}{4}$ " to $\frac{3}{4}$ ", tubes $\frac{3}{8}$ " to $2\frac{1}{2}$ " O.D.

1—No. 3 Standard, direct motor drive, capacity bars $\frac{1}{2}$ " to 6", tubes $1\frac{1}{2}$ " to 6" O.D.

1—No. 4 Standard, direct motor drive, capacity bars $3\frac{3}{4}$ " to 8", tubes $4\frac{1}{2}$ " to 13" O.D.

1—No. 3 Flat and Shape, direct motor drive, capacity, angle $2\frac{1}{2}$ " x $2\frac{1}{2}$ " x $\frac{3}{8}$ ", channels and beams up to 4", flats up to 3" x $\frac{1}{2}$ ".

1—Sutton Eng. Co. steam or air operated, Bar Straightener, with 125' of sloping type hot bed, including hot and cold runout tables.

1—Steel Building, Mill type, monitor roof, 76' span x 332' long, Crane Runway entire length, 10 ton capacity.

1—Ingersoll-Rand Air Compressor, 2100 cu. ft. capacity, direct connected to 3 Phase, 60 Cycle, 2200 Volt, Synchronous motor.

1—150 K.W. direct connected Motor Generator Set, 250 Volts, D.C. Synchronous motor, 3 Phase, 60 Cycle, 2200 Volts.

1—New 60" x 3/16" capacity, Trimming and Slitting Machine, with Tension Reel.

1—5 Stand 16" Mill, 4 stands, 3 high, 1 stand, 2 high, 1 stand pinions, open top, bottom screw type housings complete with motor and gear reduction unit.

1—Semi-Continuous Rod and Bar Mill, complete, 16" continuous roughing, 12" and 10" Finishing Mills.

1—New 5 stand, 12" Mill, 4 stands, 3 high, 1 stand, 2 high, 1 set pinions, open top, bottom screw type housings complete with motor and gear reduction unit.

1—Hot Bed, completely automatic, 200' long, hot and cold running rolls, are roller bearing equipped and direct individual motor driven.

1—155" x $\frac{1}{4}$ " Squaring Shear, direct motor drive.

1—196" x $\frac{1}{4}$ " Squaring Shear, direct motor drive.

1—No. 3 Long & Alstatter Bar Shear, direct motor drive, capacity 2" rounds, $1\frac{1}{4}$ " squares, 7" x $1\frac{1}{4}$ " flats.

1—60" x 12 Ga. Sheet Leveler, 17 rolls, $3\frac{1}{4}$ " x 64", motor drive.

2—300 H.P. General Electric Co., 250 Volt, D.C. Variable Speed Motors, 267/800 RPM.

1—900 H.P. General Electric Co., 600 Volt, D.C. Variable Speed Motor, 150/300 RPM.

1—1500 H.P. Allis-Chalmers Motor, 3 Phase, 25 Cycle, 2200 Volt, 187 RPM.

1—25 Ton Crane, 10 ton capacity, Auxiliary Hoist, 90' span, 220 Volts, D.C., built by Morgan Eng. Company.

1—20 ton Crane, 2—10 Ton Trolleys, 75' span, 220 Volts, D.C., built by Morgan Engineering Co.

1—10 Ton Crane, 2—5 Ton Trolleys, 60' span, 220 Volt, D.C., built by Cleveland Crane and Eng. Co.

1—5 Ton Crane, 60' span, 220 Volt, D.C. Roller Bearings, built by Cleveland Crane and Engineering Co.

1—5 Ton Crane, 116' span, 220 Volts, D.C., built by Pauling and Harnischfeger Corp.

1—Lewis Foundry and Machine Co. Rail Breaker or Gag Press, direct motor drive, capacity 110 lb. rails.

2—New Steel type, Mechanical Sheet Doublers.

1—New Wean Engineering Co., 2 Roll mechanical Sheet Doubler.

Mill Tables, Rod Reels, Roll Lathes, Roll Grinders, Furnace Pushers, Blast Furnace and Open Hearth Equipment, Electric Furnaces.

The equipment offered above is in first class operating condition. Complete data will be furnished upon request and arrangements will be made for inspection.

SUTTON ENGINEERING COMPANY

PARK BLDG.

PITTSBURGH, PA.

DONAHUE OFFERS

UPSETTING AND FORGING MACHINES:

National Heavy Duty: 2"—3"—4"
Ajax Suspended Slide: $1\frac{1}{2}$ "— $2\frac{1}{2}$ "—3"—4"—5"
Ajax Original Model: $1\frac{1}{2}$ "—2"—3"—7"
Acme Suspended Slide: $1\frac{1}{2}$ "

SHEARS: BAR, BILLET AND ALLIGATOR:

210 Buffalo Armor Plate Bar & Billet, cap. 37.5" rd.
27 Cleveland Steel Frame, cap. 6" rd. Pawtucket Bar, 1" and $1\frac{1}{2}$ " cap.
Pels All Steel 6" Stroke, cap. 5" round hot Doelger & Kirsten Alligator 21—22 Toledo Squaring—4" x 16 Ga.

PRESSES:

Inclinable—various sizes: 14 Straight sided and Trimming: 7

BILDOZERS:

Williams White Nos. 3—4—5—7—29

BRADLEY HAMMERS:

All sizes in Cushionet Helve and Upright

STEAM AND BOARD DROP HAMMERS:

Brand New Erie 1600-lb. Board Drop Board and Steam Drop from 400 to 12,000 pounds

STRUCTURAL TOOLS:

Brand New Hilles & Jones Plate Straightening Rolls: 6' x $\frac{1}{2}$ " or 8' x $\frac{3}{8}$ "
New Quadruple Comb. All Steel Punches and Shears, 3x3x $\frac{1}{4}$ " angles
Single and Double End Punches and Shears, all sizes and throat depths

Williams White 213 Dbl. End Punch & Shear
Williams White 212 Dbl. End Multiple Punch
Newton Cold Saws: 5" and 9 $\frac{1}{2}$ " cap.
Espan Lucas Cold Saw: 7" cap.
Angle Bending Rolls: $1\frac{1}{2}$ " x $\frac{3}{4}$ "

LATEST TYPE MANVILLE BOLT MACHINERY: All Direct Motor Driven

AUTOMATIC TRIMMERS:

1—No. 312C, capacity 5-16"
4—No. 375C, capacity $\frac{1}{2}$ "
1—No. 500C, capacity $\frac{1}{2}$ "
1—No. 625C, capacity $\frac{1}{2}$ "
1—No. 4C, capacity $\frac{1}{2}$ "

THREAD ROLLERS: AUTOMATIC FEED

3—No. 2B, capacity $\frac{1}{4}$ "
3—No. 3B, capacity $\frac{1}{2}$ "

SLOTTERS:

1—No. 3C, capacity $\frac{1}{2}$ "

BOLT, NUT & RIVET MACHINERY:

Automatic Bolt Trimmers: $\frac{3}{8}$ "— $\frac{1}{2}$ "— $\frac{3}{4}$ "
Cold Punch Nut Makers: $\frac{1}{4}$ "— $\frac{3}{8}$ "— $\frac{1}{2}$ "— $\frac{3}{4}$ "
National Bent Tappers: $\frac{1}{4}$ "— $\frac{3}{8}$ "— $\frac{1}{2}$ "— $\frac{3}{4}$ "
Vertical 6 and 8 Spindle Semi-Auto. Tappers: $\frac{1}{2}$ "— $\frac{3}{4}$ "—1"
Threading Machines: Acme and Lanthis, Single and Double Spindle: 1" to 6"
Thread Rollers: $\frac{1}{4}$ " to 1"

Economy Auto. Stud Threaders

National Gimlet Pointers: $\frac{1}{4}$ " and $\frac{3}{8}$ "
 $\frac{1}{4}$ "— $\frac{3}{8}$ " Waterbury Farrel Slitters
Hot Pressed Nut Machines: $\frac{3}{4}$ "—1"
Nut Burring Machines: $\frac{3}{4}$ "—1—1 $\frac{1}{2}$ "
Hot Headers: Ajax, Acme and National, stop motion and continuous motion, hand and auto. feed
National Hammer Bolt Headers
Semi-Auto. Hot Flash Trimmers
Auto. Bolt Pointers: $\frac{3}{8}$ " cap., MD
National Acme Bar Pointers, MD, 2 $\frac{1}{4}$ " cap.

COLD HEADERS:

Waterbury DS8D $\frac{3}{8}$ "
Waterbury DSOD $\frac{3}{8}$ " x 6"
Manville 5-16" open die Rod Header
20 Waterbury Single Stroke open die 3-32
21 Waterbury Single Stroke Solid Die 3-16"
22 Manville Single stroke solid die 3-16"
23 Manville Single stroke solid die $\frac{1}{4}$ "
24 Manville Double stroke solid die $\frac{1}{4}$ "
25 Manville double str. open die $\frac{1}{2}$ "
26 Manville double str. open die 5-16"
27 Manville double str. solid die $\frac{1}{2}$ and $\frac{3}{4}$ "
28 Waterbury Double stroke solid die toggle type $\frac{3}{8}$ "

MISCELLANEOUS

10 Adjustable steel tool racks 15' long, 8" high, 1" to 8" double with small compartments
Yoder G-30 Rotary Gang Slitter, MD
Waterbury Draw Bench
Press Brake: 8' x $\frac{1}{4}$ ", MD
Kane & Roush 21 Bar Straightener
Manville 4-slide Wire Forming Machine
Wire Straighteners: 3-16 to $\frac{1}{2}$ "
Dinge Magnetic Separator
36" Lifting Magnet
Resly 219—53" Vertical Spindle Disc Grinder

DONAHUE STEEL PRODUCTS CO.

74TH ST. & ASHLAND AVE., CHICAGO, ILL.

RE-MANUFACTURED

Partial List—See December 20th Issue

BORING MACHINES, HORIZONTAL

- No. 1 Cleveland, S.P.D.
- No. 0 Giddings & Lewis, 3" bar
- No. 3-A Universal, 3" bar
- 5" bar Barrett, Cyl. Borer, M.D.
- 5" bar Niles Bement, Pond Floor Type

BORING MILLS, VERTICAL

- 32" King, M.D.
- 36" & 42" Bullard "New Era"
- 42" King, with side head
- 48" Colburn, friction clutch
- 61" Bullard Maxi-Mill, 2 pl. hds.
- 10" Niles

DRILLS, BALL BEARING

- 1, 2, 3, 4, 6 spindle Leland-Gifford
- 1, 4 spindle Allen
- 2, 6 spindle Edlund
- 2, 4, 6 spindle Henry & Wright

DRILLS, MANUFACTURING

- 21" & 24" Cinn.-Bickford, slid. hd.
- 21" Cinn.-Bickford, stat. hd.
- 36" Baker, Heavy Duty
- No. 2 Colburn, 1-2-4 spindles
- No. 11 Colburn, 2" capacity
- No. D-5 Colburn, 2½" capacity
- No. 121, No. 217 Baker, motor drive
- No. 314 Baker, S.P.D.
- No. 10-D Moline Cylinder Borer
- No. 16-D Moline Driller, 4-spdl.

DRILLS, RADIAL

- 3" American, Triple Purpose
- 4" Western, Heavy Duty
- 5" American, Triple Purpose
- 6" American Full Universal

JIG BORER

- No. 2 Pratt & Whitney, M.D.

MILLING MACHINES, PLAIN

- No. 1-B Milwaukee, motor drive
- No. 2 Cincinnati High Power, M.D.
- No. 2-B Milwaukee, S.P.D.
- No. 3 Cincinnati High Power
- No. 3-B Brown & Sharpe, S.P.D.
- No. 3-B, No. 4-B Milwaukee, S.P.D.
- No. 4-B Brown & Sharpe, motor drive
- No. 4 Cincinnati High Power, S.P.D.
- No. 5 Cincinnati High Power, S.P.D.
- No. 5-B Brown & Sharpe, motor drive

MILLING MACHINES, UNIVERSAL

- No. 1½ Rockford
- No. 2 Ohio
- No. 2 Kempsmith
- No. 2 Brown & Sharpe
- No. 3-GS Hendey, S.P.D.
- No. 3 Cincinnati High Power, S.P.D.
- No. 4 Cincinnati High Power, S.P.D.

MILLING MACHINES, VERTICAL

- No. 1A Milwaukee, S.P.D., rotary table
- No. 2-M Cincinnati
- No. 1½-B Milwaukee, S.P.D., rotary table
- No. 3 Brown & Sharpe, single pulley drive
- No. 3 Cincinnati H.P., motor-in-base
- No. 4 Cincinnati H.P., intermittent feeds
- No. 5 Brown & Sharpe, range 52"x12"x21"
- No. 6 Becker, motor drive

MILLING MACHINES, MANUFACTURING

- 18", 24" Cincinnati Duplex, S.P.D.
- No. 3 Garvin Duplex
- No. 33-36" Kempsmith Heavy Duty

MILLING MACHINES, SLAB

- 21"x12"x20" Ingersoll, motor drive
- 24"x24"x12" Ingersoll, motor drive
- 45"x36"x17½" Ingersoll
- Bozman & Smith Dole, End Column Face

MILLING MACHINES, THREAD

- 4½"x12" Pratt & Whitney
- 6"x14" 6"x18" Pratt & Whitney
- No. 4, No. 6 Lee-Bradner
- 6"x80" Pratt & Whitney

GEAR CUTTING MACHINES

- No. 2½, No. 5½ Bilton
- No. 5 & No. 12 Barber-Colman
- No. 9-H 12" G&E Hobber
- No. 18-H 12"-30" G&E Hobber
- No. 7, No. 75, 715 Fellows
- No. 6, No. 65, No. 61, No. 615, No. 612 Fellows
- 6", 18" Gleason Bevel Gear Generators

PLANERS

- 21"x21"x6" Rockford
- 21"x21"x12" Gray
- 26" Lynd-Farguhar, Planer and Shaper
- 36"x36"x10" Gray, Rev. M.D.
- 36"x36"x12" Detrick & Harvey, open side
- 36"x36"x18" Cincinnati
- 36"x36"x24" Gray
- 48"x48"x10" Gray
- 48"x48"x18" Putnam
- 56"x56"x32" Cincinnati
- 72"x72"x12" Cincinnati

SHAPERS

- 21" Gould & Eberhardt, single pulley drive
- 24" Cinn. Hvy. Duty, Climax, S.P.D. auto lub.

Write for "GREENLIST" No. 151 just issued

HILL-CLARKE
MACHINERY CO
647 Washington Blvd. - Chicago

MILES TOOLS ARE REBUILT, TESTED AND GUARANTEED

We maintain a stock of 1500 tools from which the following are chosen at random. Send for complete list.

Millers

- Nos. 1, 2, 3, 4 and 5 Cincinnati
- Nos. 1½, 2 and 3 Brown & Sharpe
- Nos. 1½, AS and 3B Milwaukee
- Nos. 1½, 2 and 2½ Rockford
- Nos. 2 and 2½ LeBlond
- No. 3 Kempsmith
- No. 6 National Transit
- No. 1 Cleveland universal
- No. 1½ Valley City universal
- No. 25 Ohio universal
- No. 3 Kempsmith universal
- No. 2 Cincinnati vertical
- No. 3B Milwaukee vertical
- Nos. 4B and 6 Becker vertical
- 24" and 28" Cincinnati automatic
- 24" and 28" Cincinnati duplex
- No. 2M Potter & Johnston automatic
- 30" Ingersoll continuous rotary
- 48" Newton continuous rotary
- 48" Ohio tilted offset
- No. 13B Brown & Sharpe Mfg.
- 37" and 42" Briggs type B
- 26"x24"x6" Ingersoll planer type
- 48"x48"x8" Beaman & Smith open side
- 6"x18" and 6"x48" P.A.W. thread
- Trundle 2 spindle thread
- No. 2 Bilton gear miller
- Kent Owens semi automatic

Presses

- No. 1 Toledo OBI
- No. 2 Standard screw type
- No. 3 Moore OBI
- No. 3 Consolidated combination geared
- No. 4½ Niagara OBI
- No. 5 Toledo OBI, flywheel
- No. 5 Toledo OBI geared
- No. 5N American Can geared
- No. 6 Adriance OBI
- No. 6 Toledo OBI
- No. 73 Consolidated openback
- Nos. 75 & 77 Toledo openback
- Nos. 62, 65 & 67 Consolidated
- No. 63 Michigan straight side
- No. 56 Toledo straight side
- No. 74½ Bliss straight side
- No. 87 Zeh & Hahnemann S. S.
- 150 ton, No. EW52 Ferracute coining
- 800 ton No. 26K Bliss Coiling
- 31" Bliss double crank
- 34" No. 4 Bliss double crank
- 48" No. 23C Bliss double crank
- 48" Toledo No. 92½C double crank
- 82" Ferracute 8154 double crank
- No. DDG 54 Ferracute drawing
- No. 266 Consolidated drawing
- No. 41 Toledo geared horning
- 25 ton Henry & Wright dieing
- No. 94 Consolidated punching
- No. P3 Ferracute punching
- No. C82 Ferracute notching

Boring Mills, Vertical

- 24" & 34" Bullard side head
- 34" Colburn single turret
- 36" Niles
- 42" Detrick & Harvey
- 52" King
- 62" King
- 81" Niles
- 100" Betts

Punches

- No. 5 Hilles & Jones Coping
- 1" tht Long & Alstatter, ¼"x½"
- 12" tht Wickes ¾"x½"
- 12" tht Long & Alstatter 1¼"x1"
- 12" tht Cleveland horiz. 1¼"x1"
- 107" Froeh gang punch

Riveters

- High Speed Nos. 1AA, 2A, 3A, 4A & 5A
- Grant Nos. 80, 80B, 101 & 120
- 20 ton Allen pneumatic
- 20, 30 & 50 ton Hanna pneumatic

Shapers

- 15" & 24" Potter & Johnston
- 16" Smith & Mills SPD
- 16" Kelly
- 16" & 20" Milwaukee
- 20" Steptoe
- 20" & 24" Gould & Eberhardt
- 20" Hendey friction
- 24" American, SPD
- 26" Lynd Farguhar openside
- 28" Columbia
- 32" Walcott

MILES
MACHINERY COMPANY
SAGINAW, W.S.
MICHIGAN

HIGH GRADE USED and REBUILT MACHINERY

LATHES

- 16" x 6' Lodge & Shipley Sel. Grd. Hd.
- 18" x 10' Lodge & Shipley Sel. Grd. Hd.
- 19" x 10' LeBlond H.D. 3 S.C.D. D.B.G.
- 20" x 8' & 10' American Geared Head.
- 24" x 22" Bradford Cone drive.
- 25" x 12 & 14' LeBlond H.D. 3 S.C.D. D.B.G.
- 28" x 48" x 12' Harrington Gap Bed.
- 30" x 12' Lodge & Shipley Sel. Grd. Hd.
- 30" x 14' Lodge & Shipley 3 S.C.D. D.B.G.
- 36" x 16' Lodge & Shipley Sel. Grd. Hd.
- 48" x 34' Bridgeford Grd. Head.

PLANERS AND SHAPERS

- 24" x 24" x 8' Gray two heads.
- 30" x 36" x 10' Cincinnati Late type.
- 36" x 36" x 10' Gray Two heads.
- 42" x 42" x 12' Detrick & Harvey Openside.
- 16", 20" & 24" Gould & Eberhardt Late type.
- 24" Potter & Johnston, cone drive.
- 24" Cincinnati, 4 S.C.D. B.G.
- 26" Kelly Shaper 4 S.C.D. B.G.

UPRIGHT AND RADIAL DRILLS

- 23 Avey B.B. Drill Press.
- 24" Cincinnati Bickford B.G. Tapping.
- 21" Cincinnati Bickford B.G. Tapping.
- 22 Colburn 1 & 2 Spindle H.D. Drills.
- 3, 3½, 4, 5 & 6" Cincinnati Bickford Radials.
- 3, 4 & 6" American Triple Purpose Radials.
- 4" Fosdick H.D. Radial Drill, S.P.D.
- 6" Harrisburg Radial Drill.
- 230 Natee Multiple.
- 240 Natee Multiple.

GEAR CUTTERS

- 36-BM Gould & Eberhardt Gear Roughers.
- 21 Adams Farwell Gear Hobber.
- 212 Barber Colman Gear Hobber.
- 26, 61, 615 Fellows Gear Shapers.
- 6, 18, Gleason Gear Generators.
- 18H & 24H G & E Hobbers.
- 23-26" & 25-60" Brown & Sharpe Automatic.

MILLING MACHINES

- 233 Kempsmith Plain Production Miller.
- 21B Milwaukee Plain Miller.
- 22HD LeBlond Universal, Cone drive.
- 22 Rockford Universal, Cone drive.
- 23 Kempsmith Universal, Cone drive.
- 22 Cincinnati Rect. Overarm, Motor in base.
- 23B Milwaukee Plain S.P.D.
- 24 Cincinnati High Power Plain, S.P.D.
- 36" x 42" x 10' Ingersoll Adj. Rail.

GRINDERS

- 25 Oliver Drill.
- 22 Ohio Tool & Cutter.
- 22 Oakley Tool & Cutter.
- 23 Abrasive Surface Motor in base.
- 22 Wilmarth & Marmon Surfacers.
- 224-53" Gardner Disc Grinder.
- 6" x 18" Landis Self contained.
- 10" x 24" Landis Self contained.
- 16" x 48" Landis Self contained Pin Grinder.
- 55, 60 & 65 Heald Internal Grinders.
- 10 H.P. U.S. Buffer A.C. Motor Drive.

BORING MILLS

- 72" and 84" Cincinnati Late type.
- 60" Niles Bement Pond.
- 235 Landis & 240 Landis Horz. Mills.
- 24", 36" & 42" Bullard New Era.

MISCELLANEOUS

- 23B Lapointe Broaching Machines.
- 25 Toledo Open Back Inclination Press.
- 292½A Toledo Geared Straight Side Press.
- 276 Toledo Open Back Press.
- 243 Robinson Double Crank.
- 1" & 2" Landis Bolt Cutters, cone drive.
- 1½" Acme Class A Bolt Cutter.
- 22 Geist Pipe Cutter.
- 1¼" Landis Pipe & Nipple Threader.
- 2" Landis Pipe Machine.
- 2304B Oster Pipe Machine.
- 22 Long & Alstatter Motor Drive Punch.
- Rock River Punch & Shear 36" throat.
- Lysholm Double End Punch & Shear; 36" throats.
- 2B Long & Alstatter Angle Shear.
- 6" x 6" Peerless Univ. Shaping Saws.
- High Speed Riveters. All sizes.
- 21 & 2X Garvin Tappers.
- 10 K.W. Federal Spot Welders.
- 50 K.V.A. Gibbs Spot Welder.
- 12" Betts Crank Slotter.

**CINCINNATI MACHINERY
& SUPPLY CO.**

28-30-32 West 2nd St., Cincinnati, Ohio

Take Notice BRAND NEW Take Notice

Smith Triple and Quadruple Combination Punches, Shears, Angle and Bar Cutters and Single End Punches

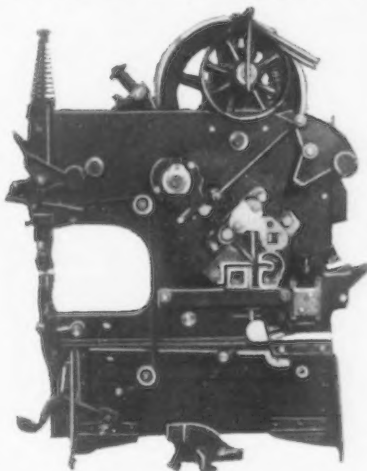
SAVE FROM 50 to 75% WHILE THEY LAST

Combination Punch and Shears

Size	Regular Price	Our Price
#11	\$1,250	\$700
#13	1,550	800
#16	1,950	900
#20	3,350	1,500

Combination Punch and Shears With Notching Attachment

Size	Regular Price	Our Price
#13	\$1,675	\$850
#16	2,150	1,000



Single End Punch Machines

Size	Regular Price	Our Price
#9	\$640	\$200
#13	840	250
#16	1,035	325
#20	1,300	400

ALL PRICES ARE F.O.B.
BROOKLYN, N. Y.

WRITE FOR DESCRIPTIVE
CATALOGUE

We Also Have a Limited Amount of Used Machines, Including Two Large Sized Angle and Bars Shears, Ryerson Friction Saw, No. 20 Schatz Combination Punch and Shear, No. 20 Amplex Combination Punch and Shear, Several Pipe Cutting and Threading Machines, Etc.

For Further Information, Write or Wire Us or Our Sole Selling Agent, Albert Schulman, 41 Broadway, Brooklyn, New York.

FISHER BROS. STEEL CORP.

139th STREET AND MORRIS AVENUE

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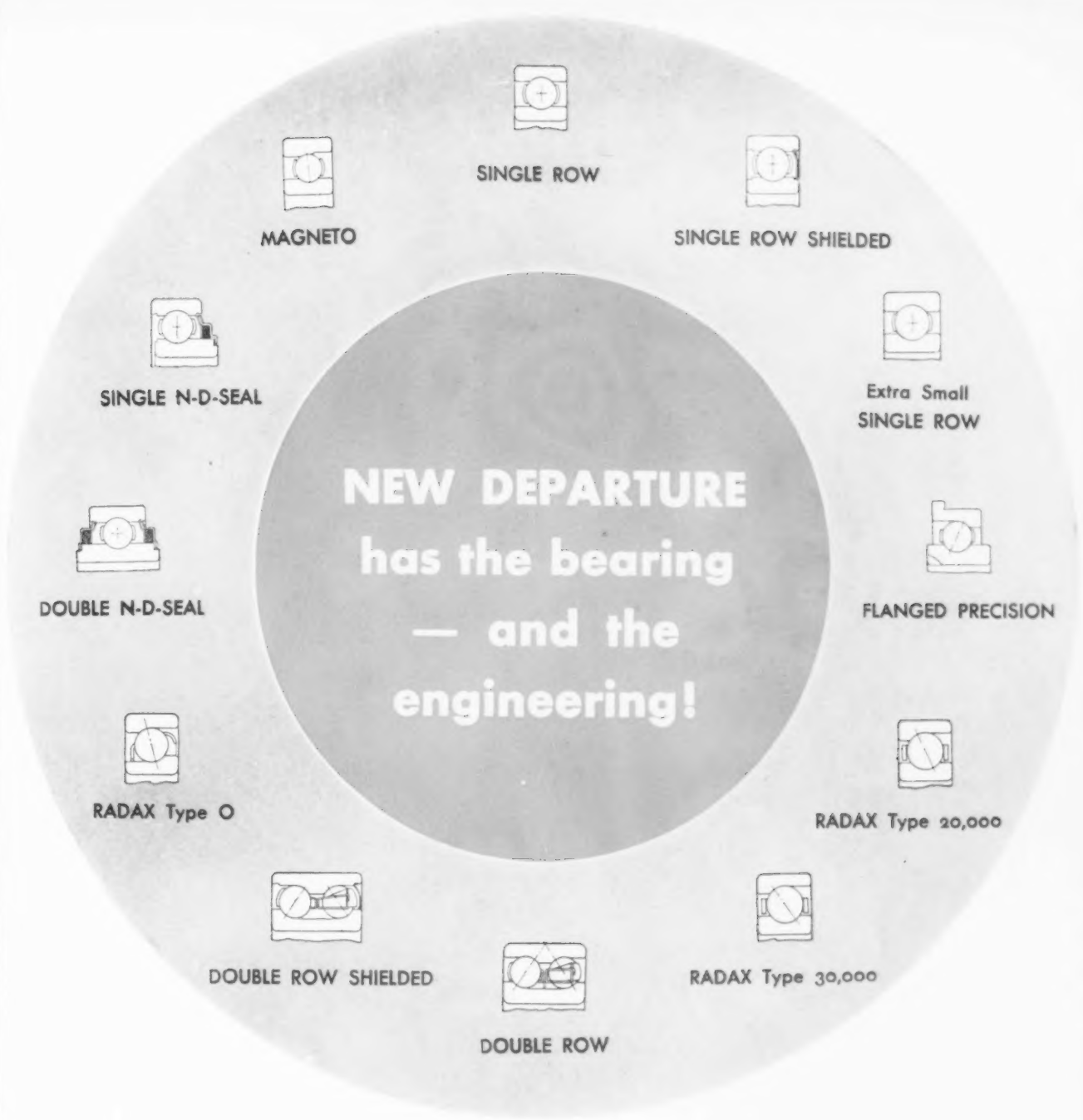
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Chambersburg Engng. Co.	12-13-14-15-16-17	Ingersoll-Rand Co.	188	Pittsburgh Welding Corp.	488	Worth Steel Co.	414
Champion Rivet Co., The	458	Ingersoll Steel & Disc Co.	394	Plymouth Locomotive Wks.	379	Wright Meh. Co.	488
Champion Sheet Metal Co., Inc.	455	Interlake Iron Corp.	285	Power Transmission Council	265	Wright Mfg. Co.	378
Chicago Rawhide Mfg. Co.	357	International Nickel Co., Inc.	295-296	Pratt & Whitney Co.	230-231	Wyckoff Drawn Steel Co.	250
Cincinnati Mehry, & Supply Co.	482	Iroquois Mehry, Co.	484	Production Meh. Co.	452	Yale & Towne Mfg. Co.	370
Cincinnati Shaper Co.	176	Janney, Joseph A., Jr.	465	Progressive Mfg. Co.	456	Yoder Co., The	244
Clapp, E. D., Mfg. Co.	392	Jeffrey Mfg. Co.	380-381	Rathbone, A. B., & J.	434	Youngstown Sheet & Tube Co.	384-385
Clark Bros. Bolt Co.	458	Jessop, Wm., & Sons, Inc.	440	Raymond Mfg. Co.	460	Zapon Co., The	447
Clark Controller Co.	247	Johnson Bronze Co., Inc.	280	Reading Iron Co.	454		
Clearing House Section	474-486	Johnson Steel & Wire Co., Inc.	457	Reliance Elec. & Engineering Co.	26		
Cleveland Cap Screw Co., The	433	Jones & Lamson Mch. Co.	45	Republic Steel Corp.	1		
Cleveland-Cliffs Iron Co.	44	Jones & Laughlin Steel Corp.	417-418	Rhoades, R. W., Metalline Co., Inc.	404		
Cleveland Crane & Engng. Co.	374-375	Jones, E. L., & Co., Inc.	488	Rhoads, J. E., & Sons	390		
Cleveland Steel Tool Co., The	452	Kennard-Rafkin Mehry, Co.	485	Ridgway, Craig, & Son Co.	462		
Cleveland Tramrail	374-375	Knox, Earl E., Co.	485	Ritterbusch & Co., Inc.	479		
Cleveland Twist Drill Co.	319	Laclede Steel Co.	413	Riverside Mehry, Depot	484-485		
Colonial Broach Co.	24	Laclede Tube Co.	413	Riverside Metal Co.	80		
Colonial Steel Co.	6-7	Lancaster Malleables & Steel Corp.	255	Robbins & Myers	462		
Columbia Steel Co.	240-241, 389	Landis Machine Co., Inc.	18-19	Rockford Drilling Meh. Co.	462		
Cone Automatic Mach. Co., Inc.	451	Landis Tool Co.	242	Rockford Forge Co.	454		
Conran, Frederick M.	465	Lansing Co.	463	Rockford Meh. Tool Co.	454		
Continental Steel Corp.	401	Lansing Spg. Co.	455	Rockwell, W. S., Co.	468		
Contract Manufacturing Section	488	LaSalle Steel Co.	399	Roebling's, John A., Sons Co.	316-317		
Cook Spring Co., Div. Barnes	25	Lee Spring Co.	457	Rosenkranz & Welschke	484		
Gibson-Raymond, Inc.	25	Latrobe Elec. Steel Co.	453	Ross Power Equip. Co.	485		
Crawford, F. H., & Co., Inc.	480			Ruemelin Mfg. Co.	469		
Crosby Co., The	442						
Crucible Steel Castings Co.	455						
Cruse-Kemper Co.	487						
Curtis & Curtis Co.	322						

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